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ABSTRACT

This study concerns the nutritional habits and knowledge of elementary and secondary students in North Carolina. It was hypothesized that nutritional education would influence the amount and kinds of food consumed and possibly student attitudes toward the school linch program. The project was carried out in a 2-year experimental program. During the first year, elementary, junior high, and high school students were queried before and after nutritional education classes to measure weight and nutrient analysis of food refuse, student attitudes, and student ratings of acceptability of food items. Results of this phase indicate that elementary school children below the fifth grade might be more amenable to changes in dietary habits and attitudes due to nutrition education. Studies during the second year focused on primary grades. Also included in this study are information about curriculum development and inservice training of teachers, details of purposes, proposed methods for accomplishing goals, results, statistical analyses, and sample tests. (JCW)

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Optimizing the Effectiveness of School Food Programs for Feeding and Educating Children in North Carolina

Technical Report

Effects of Nutrition Education on School Children

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OVERVIEW

This nutrition education study was one part of a multiphase research project in the Food Science Department at North Carolina State University. The total project, funded by OEO-EFMS, 1970-1973, was concerned with a broad evaluative study of the North Carolina School Lunch Program. An economic phase included development of cost collection techniques and establishment of a framework for evaluating costs of the National School Lunch Program. The non-economic phase has included analysis of nutritive value served and consumed, student acceptability of school-served food, student attitude toward school lunch and other school-related factors, school food service worker attitude toward their work, and effects of nutrition education on food acceptability,,food consumed and student attitude. The nutrition education aspect of this research project was jointly administered by North Carolina State University and the North Carolina State Department of Education.

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INTRODUCTION

That dietary status and eating patterns are, among other factors, influenced by one's environment, knowledge of foods and inclusion of a variety of foods in the diet is well documented. It is also known that many children and adults in North Carolina receive a diet inadequate in amounts and kinds of foods essential for optimal health.

It was hypothesized that nutrition education would influence amount and kinds of food consumed and possibly student attitude toward the school lunch program. During year I, pre and post measures of weight and nutrient analysis of food refuse, student attitude, and student ratings of acceptability of food items were obtained in order to assess effects of the treatment. The experiment was designed to include students from elementary, junior high and senior high levels.

Since measurable effects of nutrition education were appreciably greater for fifth grade students than for seventh or tenth grade students it was postulated that elementary children below fifth grade might be even more amenable to changes in dietary habits and attitudes due to nutrition education. An additional year's study was planned for first through third grade students. The Year II nutrition education study did not include food acceptability ratings nor attitude measurement from students because of the ages of the sample. Effects of this phase were measured by amount consumed and cognitive nutrition tests which were especially designed for the younger children.

These two phases were pilot programs which included curriculum development and in-service training of teachers as well as implementation of classroom teaching of nutrition. Complete details of purposes, proposed methods for accomplishing goals and actual results are described herein.

OBJECTIVES OF NUTRITION EDUCATION

To implement on a pilot scale a nutrition education program.

To assess effects on nutrition education on:

- cognitive knowledge of nutrition;
- student ratings of acceptability of school-served food items;
- amount of food consumed;
- nutrients consumed;
- student attitude.

Nutrition Education

Year I

METHODOLOGY

In carrying out objectives of the study for Year I, nutrition education classes were conducted in selected classes of fifth, seventh, and tenth grade students. Prerequisite to this was training of teachers. Pre and post measures (before and after nutrition education classes) were obtained of the following: student ratings of degree of liking for school-served food items as measured by a hedonic scale; weight of refuse; laboratory nutrient analysis of food served and of refuse; and student attitude toward schools with emphasis on school lunch.

Sample

School superintendents were visited, the study was explained to them, and permission to use their schools in the research was obtained. After official notification of the grant, the superintendents, in consultation with members of the research team, selected specific schools to be used in Rocky Mount and Goldsboro City and in Nash and Edgecombe County administrative units. It was essential that the schools be selected immediately, since plans had to be developed for starting the program by the beginning of the second month of the program year. When possible, selection was based on the racial mixtures in the schools and the economic level of the area from which pupils came. It was essential also, however, to select schools in which the principals would be willing to cooperate in the study. The portion of the study carried out in each school, as well as the number of students, involved in each type of treatment, are summarized in Table 1. Results, excluding effects on attitude, have been published[1].

[1]Head, M. K., A nutrition education program at three grade levels. Journal of Nutrition Education, 1974, Vol. 6, No. 2, 56-59.

Table 1. Number of students receiving various treatments in schools cooperating in project first phase.

School	Grade	Treatment[ξ]			
		Acceptability[ψ]	Attitude	Refuse	Nutrition Education[§]
Braswell	5	202	75	75	50
Baskerville	5	250	96	96	
D. S. Johnson	5		57		
Nashville	5	382	129	129	64
Bailey	5	253	84	84	
W. Edgecombe	5		143		
Parker	7	558	248	182	66[§]
Middle South	7	424	96	96	
Middle North	7		128		
N. Edgecombe	7	229	126	126	66
S. Edgecombe	7	253	133		
Coopers	7		125		
Rocky Mount	10	1540	412	208	104
Phillips	10	434	110	110	

[ξ] Larger samples within a school include students numbered in smaller samples in the same school.

The total number of students is given in each. Thus, any larger number includes students numbered in any smaller sample to the right. For example, in the first school, 50 students had nutrition education. Refuse was collected from them plus from an additional 25 students in a control class, and all 75 of those students rated the attitude scale. All students who took the attitude scale were included in the sample who were given acceptability score cards.

[ψ] For acceptability, in 5th grade schools, ratings were collected from 4th to 6th graders; in 7th grade schools, from 7th to 9th graders, exception, Parker, an all 7th grade school; in 10th grade schools, from 10th to 12th graders.

[§] Students divided between at least two classes (two teachers). In tenth grade an additional group of students had the nutrition education teacher, but did not get nutrition education.

In-Service Teacher Training

On July 16 and 17, 1970, a conference was held for the purpose of making initial plans for a Nutrition Education Workshop for teachers. Attending the conference were one teacher from each school which had been selected to receive nutrition education, consultants from the State Department of Education (SDE) in the areas of school food service and consumer and homemaking education, representatives from OEO, a consultant from a school which had carried out an extremely successful nutrition education program, and members of the university research team.

During the first day of the conference, ideas were gained from the teachers about what they felt they needed in order to conduct nutrition education in their classes. On the second day, a smaller group made more specific plans after defining objectives for the workshop and basic teaching concepts to be developed in nutrition education. The instructional objectives determined the most important for the in-service teacher training are listed below:

1. Demonstrate an understanding of basic nutrition concepts to teach students in grades 5, 7, and 10.
2. Review, evaluate, and select instructional materials appropriate for teacher and student references, and demonstrate how these materials may be used with assigned students.
3. Identify resources within the community that may be used in the instructional program.
4. Develop schemes, techniques appropriate for instructional use in grades 5, 7, and 10.

The Consumer and Homemaking Education Division of the State Department of Education assumed primary responsibility for developing detailed plans for the workshop, which was held in Rocky Mount on August 3 through August 7, 1970. Nine teachers representing the five Nutrition Education target schools attended; in addition, the extension agents responsible for nutrition in Nash and Edgecombe County offices of the Agricultural Extension Service attended. It had originally been intended that two teachers from each school would be present; however, circumstances permitted only one teacher from Parker Junior High to attend. The teachers earned two credits toward their continuing education requirement, and were given $75 stipend plus traveling expenses.

Since the teachers had not had nutrition education as a part of their pre-service professional education, a basic review of nutrition, dietary patterns, and composition of food was dealt with by speakers and through visuals. Another component of seminar activities involved having teachers review a variety of publications, transparencies, films and filmstrips for possible use in curriculum development or activities with students.

Resource people and industries (production, wholesale and retail) in the project area were identified. Teachers were encouraged to plan field trips with students to visit some food establishments. Nutrition aides employed by the State Extension Service offered their services to families needing direct home visitation and individual education program. The last phase of the workshop permitted the teachers to develop some curriculum plans, including student learning activities which they proposed to carry out during the coming school year.

Pre and post testing procedures were used to determine changes in cognition of nutrition concepts of the teachers involved in the workshop. A copy of this test is shown in Appendix A. The number of errors on the pre and post test were determined for each teacher and the results are given below.

Teacher	Pre-Test Error	Post-Test Error
#1	27	10
#2	19	11
#3	21	6
#4	23	12
#5	8	1
#6	6	5
#7	16	2
#8	17	9
#9	7	3

All teachers demonstrated expanded knowledge of nutrition concepts and were able to identify an increased number of community resources which could be used to enhance classroom instruction at the end of the seminar.

Teacher reaction toward the workshop was generally favorable. Most were very stimulated by the techniques they learned, the community contacts they made, and by the subject itself. Although they seemed anxious to start nutrition education in their classes, they were cautioned that they must not start until November 1, after the first data on attitude, food acceptability, and food refuse had been collected. A three-hour follow-up workshop was held in October to clarify details for carrying out the nutrition education in the classroom.

Testing of Students

Knowledge of Nutrition

In October, students in each class which was to be involved in nutrition education and students in control classes in each school were given a test to determine their knowledge of nutrition. The tests used for each grade

level are shown in Appendix A. For the lower grades, the test was primarily an audio-visual instrument with answer sheets provided.

TOUS Test

The TOUS (test on understanding science) was given to all eight classes of tenth graders in October and April. This test, developed at the Harvard University Graduate School of Education, Cambridge, Massachusetts, was printed by Educational Testing Service, Princeton, N. J., for experimental purposes only. Four of these classes received nutrition education through the biology course; the remaining four had the same two teachers but were taught biology by the conventional method.

Dietary Recall

In all participating grades, three-day dietary recall data were obtained from students in October 1970 and April 1971 from the nutrition education group and from a similar group in the same school who were considered nutrition education controls. Number of students from whom dietary recall data were collected can be found in Tables 6, 7, and 8 on pages 21-23. The type of information obtained from the students was the same for all grade levels although the form for listing foods eaten by different age groups differed slightly, as shown by sample forms in Appendix B. In the fifth grade, teachers agreed to give aid to students who experienced difficulty in recording their intakes. From the appearance of and information on the raw data sheets, however, the implication is that very little teacher aid was given.

The information given on the recall forms was converted to numerical scores. The scale was designed on the Basic Four food groups with four points being assigned for each recommended serving. After the three day score was obtained, points were subtracted if there were insufficient servings of foods high in ascorbic acid and Vitamin A, to give the final total score. This subtraction point system was based on present requirements for the Type A lunch. The scoring is shown in detail in Appendix B,

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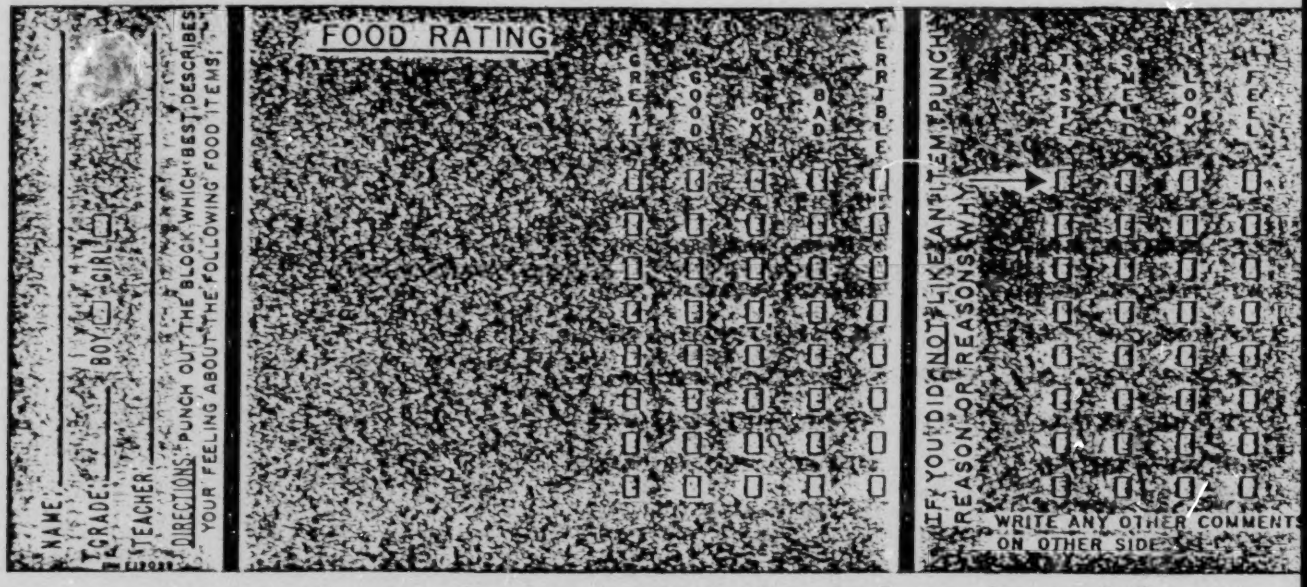
along with dietary recall forms which were adapted from Boyd[2] (1969) and Adams[3] (1970).

Food Acceptability Rating

Food acceptability was carried out in ten schools as shown in Table 1. Ratings from nutrition education groups and non-nutrition education groups were kept separate. "Porta-punch" cards, obtained from IBM, were used. A sample is shown below.



For each day, the menu to be served in the school was mimeographed in the space provided. Students were instructed on the purposes, potential values, and use of the cards. Teachers were requested to refrain from influencing student reponses. A more detailed report on these procedures will be included in a separate report which is being prepared.[4]

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[2] Boyd, F. L. A resource guide for use in teaching nutrition grades one through seven. Vocational Education Division, Georgia Department of Education and College of Education, University of Georgia, p. 18, 1969.

[3] Adams, G. S. Evaluation of nutrition education. Twenty-four hour food habit survey. Appendix exhibit IV, pp. 19-20, 1970

[4] Head, M. K., Giesbrecht, F. G., Weeks, R. J. and Johnson, G. N., Optimizing the effectiveness of school food programs for feeding and educating children in North Carolina. Technical Report: Student Acceptability of School-Served Food Items. In preparation.

Attitude Measurement

Students' attitude toward school lunch and other school-related factors was assessed before and after nutrition education. Other factors under consideration were administration, facilities, program, sensitivity and transportation. Items for these six areas were intermingled and unidentified on the scale as presented to students but were separated into subscales for scoring. Complete details on scale development are documented under separate cover.[5]

Food Consumed

Method used to determine actual food consumed was nutrient content of food items obtained by sample tray collection minus the nutrients from refuse collection; nutrient content was established through laboratory analysis. Lunch trays were collected at randomly determined times throughout the period during which the selected age groups were being served. On the same days that lunch trays were collected, refuse was collected. In schools in which nutrition education was conducted, refuse from nutrition education students was kept separate from that of non-nutrition education students. Details of these procedures are to be included in a report on student acceptability of school-served food which is in preparation.[6]

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[5]Head, M.K., Giesbrecht, F. G., Weeks, R. J., and Johnson, G. N. Documentation of development of a scale to measure student attitudes toward school and toward school lunch. Located in Food Science Library, North Carolina State University, 1974.

[6]Head, loc. cit.

RESULTS AND DISCUSSION

Nutrition Experiences

Teachers involved in the nutrition education project had been visited by SDE consultants prior to the date of pretesting. Projected student activities and questions related to classroom learning experiences were discussed at that time. Teachers were instructed not to begin nutrition education learning activities until after administration of all pretests.

Dates for pre- and post-testing of students in grades five, seven, eight and ten were arranged with the principal and teachers in each of the schools. Purposes of the project were interpreted to each of the classes in introduction of the pretest. Students were not told whether their class was a project or control group. Numbers of students involved in various treatments in participating schools were shown in table 1, page 5.

Types of student learning experiences varied among teachers and grade levels. While nutrition was generally integrated with curriculum in the fifth grade, it was taught through the health course to seventh grade students and through the biology course to tenth grade students. A variety of instructional activities were included and most of the students at the same grade level experienced similar types of activities. The majority of teachers reported that tasting parties had been the most effective technique. Others identified by teachers as being effective were: field trips, planning menus, creative writing, skits, role-playing and keeping project booklets.

Some of the activities developed for student participation by teachers in selected schools were animal feeding experiments, taping class discussions, learning about available community resources, surveying food acceptability in

the lunchroom preparing foods served in tasting parties for the family, personal projects to learn to eat new foods, and planning a menu which was served in the lunchroom. One fifth grade teacher assigned students to develop a nutrition education notebook; another kept a progressive notebook or class activities and reactions. Student projects were especially revealing and showed among participants the development of some basic concepts of interrelationships between food, nutrition, and health. Project personnel and SDE consultants taped some of the nutrition experiences in the classroom; these are on file with the State Department of Education.

Teachers identified the following limitations to project activities: physical facilities of classroom or school; lack of reinforcement in the home; lack of available appropriate printed materials, and lack of teacher time. No school reported success in reaching parents with nutrition education; however, comments from parents, other members of families and students provided evidence of parent recognition of project activities, interest in classroom experiences, and reinforcement of learnings at home.

Testing of Students

Cognitive Nutrition Test

Pre and post tests for measuring knowledge of nutrition were given to groups of students receiving nutrition education and to control groups. Results are summarized in Table 2. A summary statement of test results and statistics are shown in Appendix C, pp 130-135. Significant differences (P=.05) between scores of nutrition education (NE) and control (NEC) classes on the posttest occurred in both elementary schools and in one junior high school.

Table 2. Summary of total scores on nutrition test.

Score Range (percent correct responses)	Percentage of Students							
	October		May		October		May	
	NE	NEC	NE	NEC	NE	NEC	NE	NEC
	Fifth Grade							
	Braswell				Nashville			
90 - 100	2%	0	48	8	0	3	19	16
80 - 89	37	38	25	33	23	21	54	41
70 - 79	41	38	25	42	40	37	20	29
60 - 69	14	15	2	17	22	29	5	7
50 - 59	4	9	0	0	10	8	2	7
40 - 49	2	0	0	0	3	2	0	0
< 40	0	0	0	0	2	0	0	0
	Seventh Grade							
	Parker				North Edgecombe			
90 - 100	8	9	44	11	7	17	20	5
80 - 89	58	31	39	39	35	46	39	43
70 - 79	28	33	13	32	30	21	26	29
60 - 69	3	19	3	18	23	13	14	21
50 - 59	3	7	2	0	3	3	0	2
40 - 49	0	0	0	0	0	0	0	0
< 40	0	0	0	0	0	0	0	0
	Tenth Grade							
	Rocky Mount Senior High							
90 - 100	0	0	3	0				
80 - 89	4	0	8	6				
70 - 79	21	15	35	26				
60 - 69	32	32	19	22				
50 - 59	26	19	24	18				
40 - 49	6	17	4	15				
30 - 39	6	8	7	6				
20 - 29	4	9	0	5				
< 20	1	0	0	1				

TOUS Test

In order to determine possible effects of nutrition classes on knowledge of science tenth grade students in participating schools were given the TOUS (test on understanding science). Comparison of total scores from October and April is given in Table 3. Statistics are shown in Appendix C, Table 29. In comparing the October and April scores on TOUS there were no significant differences between scores of experimental and control groups.

Dietary Recall

It was interesting that when classes had studied unfamiliar or generally unpopular vegetables, counts of students who ate these vegetables in the cafeteria indicated that those who had had experience with the food were far more willing to eat previously unpopular items. An example is given in Table 4 of a survey made by a teacher taken on a day brussel sprouts were served in the cafeteria. It is obvious which class had cooked and tasted brussel sprouts prior to serving day.

Another example of how ideas toward specific foods were changed by nutrition education was shown in data recorded in a teacher's notebook. At the beginning of the classes students recorded on paper two foods they did not like and sealed these papers in an envelope. They were instructed to try to learn to eat these foods. A total of forty-five foods were listed as dislikes, thirty-nine of which were vegetables. The general unpopularity of vegetables is also shown in acceptability data discussed more fully in a report which is in preparation.[7] At the end of the year when envelopes were opened, it was found that fifteen students had learned to like both of their listed foods) and nine had learned to like one of the foods they

[7] Ibid.

Table 3. Class averages and percentile ranks[1] on Test on Understanding Science among nutrition education (NE) and non-nutrition education (NEC) students.

Group	October		May	
	Average Score	Percentile	Average Score	Percentile
Teacher 1				
NE	22.4	19	22.0	19
NE	28.0	46	26.6	40
NEC	26.3	36	25.7	36
NEC	25.0	32	23.6	28
Teacher 2				
NE	24.2	28	25.6	36
NE	23.7	28	25.7	36
NEC	27.0	40	28.2	46
NEC	19.7	14	16.9	7

[1]Based on nationwide sample of 3,009 public and private school students tested in October, 1960.

Table 4. Student survey results of unfamiliar food item consumption after prior exposure of NE_2 groups to item.

Group	Number of students	
	Ate in Lunchroom	Ate Brussel Sprouts
NEC_1	28	2
NEC_2	30	0
NE_1	27	2
NE_2	21	16

had listed. Many likes and dislikes had changed. On dietary recall forms in April and October, the fifth grade students were asked to list more liked and disliked foods. Foods listed, along with numbers who listed these, are given in Table 5.

A summary by grades of three-day dietary recall data obtained from students in October 1970 and April 1971 from nutrition education groups (NE) and control groups (NEC) is presented in Tables 6, 7, and 8. In Table 9 is given the percentage of nutrition education (NE) and non-nutrition education (NEC) students obtaining various amounts of recommended food groups computed from dietary recall data before and after nutrition education classes. Analyses of variance of total dietary recall scores in October and April, and analyses of differences in dietary recall scores for four food groups, Vitamin A and Vitamin C can be found in Appendix C, Tables 30 and 31. Among seventh graders, nutrition education groups improved their diets (P=.05) more than did control classes. Among fifth graders, there were no significant differences in change of dietary habits between experimental and control groups. It is difficult to determine an unknown confounding influence, e. g., seasonal variation in amounts consumed.

Food Acceptability

Acceptability data are summarized in Table 10. Data in this table shows summarized acceptability ratings of individual food items by students in nutrition education and non-nutrition education groups. A complete report on this phase of the project is in preparation.[8]

Attitude Measurement

Attitude of students toward six categories of school life was assessed

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[8] Ibid.

Table 5. Food likes and dislikes listed by fifth grade students.

Food Item	Number of students who listed foods					
	October			April		
	NE[ξ]	NEC[Ψ]	Total	NE[§]	NEC[Ω]	Total
			Likes			
Entrees						
Bacon	0	0	0	11	13	24
Barbeque	5	13	18	0	0	0
Beef	0	0	0	13	6	19
Chicken	48	39	77	53	42	95
Eggs	23	21	44	24	22	46
Fish	28	15	43	26	21	47
Ham	17	25	42	20	21	41
Hamburger	43	43	86	43	40	83
Hot dogs	40	39	79	35	37	72
Pizza	3	10	13	0	0	0
Pork chops	31	9	40	13	16	29
Shrimp	3	5	8	0	0	0
Spaghetti	15	14	29	22	7	29
Steak	42	23	65	53	23	76
Turkey	8	15	23	0	0	0
Cereal Products						
Bread	5	20	25	27	23	50
Cereal	0	0	0	5	7	12
Rice	0	0	0	25	17	42
Dairy Products						
Cheese	0	0	0	16	6	22
Milk	19	22	41	48	31	79
Ice cream	9	27	36	41	30	71

[ξ]Represents listings from 91 students.

[Ψ]Represents listings from 70 students.

[§]Represents listings from 98 students.

[Ω]Represents listings from 76 students.

Table 5. Continued

Food Item	Number of students who listed foods					
	October			April		
	NE	NEC	Total	NE	NEC	Total
Fruits						
Apples, fresh	34	28	62	58	37	95
Applesauce	4	7	11	0	0	0
Orange	14	18	32	40	22	62
Watermelon	0	0	0	0	8	8
Vegetables						
Beans, green	0	0	0	17	2	19
Beans, lima	9	11	20	10	21	31
Cabbage, slaw	0	0	0	12	10	22
Carrots	18	5	23	0	0	0
Corn	30	19	49	21	18	39
Peas	22	18	40	0	0	0
Potatoes	36	31	67	54	38	92
Potatoes, french fried	16	21	37	39	25	64
Salad[T]	0	0	0	13	5	18
Tomatoes	0	0	0	20	3	23
Vegetable soup	10	24	34	25	15	40
Miscellaneous						
Candy	27	20	47	20	20	40
Cake	31	24	55	37	32	69
Cookies	11	17	28	21	23	44
Jello	4	20	24	0	0	0
Jelly	0	0	0	13	12	25
Carbonated drinks	16	16	32	16	10	26

[T] Term often used in certain areas of North Carolina for mixed greens. From listing by students, it is not clear whether this refers to tossed salad or to mixed greens.

Table 5. Continued

Food Item	Number of students who listed foods					
	October			April		
	NE	NEC	Total	NE	NEC	Total
			Dislikes			
Entrees						
Fish	3	11	14	9	7	16
Liver	19	3	22	0	0	0
Cereal Products						
Corn Bread	1	6	7	0	0	0
Dairy Products						
Cheese	0	0	0	7	6	13
Fruits						
Cranberry Sauce	0	0	0	8	0	8
Vegetables						
Asparagus	0	0	0	20	8	28
Beans, lima	5	5	10	0	0	0
Beets	22	3	25	0	0	0
Broccoli	8	11	19	23	14	37
Cabbage	7	15	22	24	10	34
Cabbage, slaw	4	9	13	3	8	11
Carrots	7	2	9	10	6	16
Greens[Φ]	7	15	22	12	6	18
Greens, collard	0	0	0	12	10	22
Greens, spinach	10	8	18	17	7	24
Greens, turnip[Φ]	0	0	0	2	7	9
Peas	13	6	19	12	17	29
Squash	26	12	38	24	11	35
Sweet Potatoes	8	7	15	0	0	0
Tomatoes	13	9	22	21	7	28
Turnips[Φ]	0	0	0	11	0	11
Vegetable soup	7	0	7	0	0	0

[Φ]These food items are reported as they were listed by students. Whether the student was distinguishing between turnip roots and turnip greens is not known.

Table 6. Summary of dietary recall data from fifth graders.

Item-Score Range	Percentage of Students							
	Braswell				Nashville			
	October		April		October		April	
	NE	NEC	NE	NEC	NE	NEC	NE	NEC
	N=47	*N=24*	*N=47*	*N=24*	*N=56*	*N=60*	*N=56*	*N=60*
Total Score								
156-135	2	0	26	8	2	10	7	28
134-113	34	25	42	33	7	18	21	32
112-91	43	54	26	33	41	33	41	20
90-69	13	17	2	21	29	32	20	15
68-47	8	0	4	4	14	12	9	5
< 47	0	4	0	0	7	3	2	0
Milk								
36-31	34	13	30	25	7	12	20	30
30-25	9	25	13	13	20	10	5	12
24-19	23	17	32	13	23	32	36	22
18-13	11	8	2	17	29	10	20	15
12-07	21	25	6	29	16	32	14	20
< 07	2	13	9	4	5	5	5	2
Meat								
24-21	60	54	79	83	46	62	54	80
20-17	32	33	15	4	30	13	23	12
16-13	2	4	2	13	13	10	16	3
12-09	4	4	2	0	11	7	5	2
08-05	2	4	2	0	0	7	0	2
< 05	0	0	0	0	0	2	2	2
Vegetables								
48-41	15	25	13	17	9	18	20	30
40-33	4	21	17	25	14	15	21	27
32-25	32	33	17	8	21	23	23	25
24-17	23	8	32	17	32	18	21	7
16-09	21	8	17	17	16	22	11	8
< 09	4	4	4	17	7	3	4	3
Bread								
48-41	21	8	74	50	9	8	11	37
40-33	32	38	15	8	14	13	32	32
32-25	23	25	4	29	27	25	25	12
24-17	19	21	2	13	27	25	13	13
16-09	4	8	2	0	7	7	18	3
< 09	0	0	0	4	16	15	2	3
Vitamin A								
-1	4	8	15	38	4	3	2	0
-2	62	63	72	50	64	75	36	23
Vitamin C								
-1	21	17	26	25	23	17	9	13
-2	23	29	23	46	23	25	29	5
-3	34	29	19	25	32	37	16	3

Table 7. Summary of dietary recall data from seventh graders.

Item-Score Range	Percentage of Students							
	North Edgecombe				Parker			
	October		April		October		April	
	NE	NEC	NE	NEC[ξ]	NE	NEC	NE	NEC
	N=18	*N=18*	*N=37*		*N=46*	*N=26*	*N=46*	*N=26*
Total Score								
156-135	0	14	11		0	0	7	8
134-113	17	22	22		11	31	30	15
112-91	28	38	44		41	46	37	50
90-69	28	16	11		39	15	22	23
68-47	17	3	6		7	8	4	4
< 47	11	8	6		2	0	0	0
Milk								
36-31	11	8	11		7	4	9	8
30-25	0	0	0		9	4	17	4
24-19	18	24	17		26	23	28	23
18-13	11	3	6		11	19	9	15
12- 7	17	46	56		35	31	30	31
< 7	44	19	11		13	19	7	19
Meat								
24-21	33	76	72		70	69	83	73
20-17	28	8	11		17	23	9	8
16-13	22	3	6		4	4	4	12
12- 9	11	3	6		2	4	2	4
8- 5	0	8	0		4	0	0	4
< 5	6	3	6		2	0	2	0
Vegetables								
48-41	11	27	22		0	8	9	12
40-33	6	8	11		9	23	7	12
32-25	11	8	6		20	31	15	15
24-17	44	19	22		28	27	22	46
16- 9	17	27	33		30	8	30	15
< 9	11	11	6		13	4	17	0
Bread								
48-41	28	68	67		35	54	72	58
40-33	11	5	11		24	19	9	8
32-25	22	16	17		24	23	11	27
24-17	28	0	0		13	4	7	8
16- 9	11	8	0		2	0	0	0
< 9	0	3	6		2	0	2	0
Vitamin A								
-1	0	0	0		0	23	26	54
-2	78	73	67		52	38	52	35
Vitamin C								
-1	22	14	17		28	12	33	15
-2	17	24	22		30	12	15	50
-3	28	19	28		17	23	24	31

[ξ] Data not received from school

Table 8. Summary of dietary recall data from tenth graders, Rocky Mount Senior High

Item-Score Range	Percentage of Students			
	October		April	
	NE	NEC[ξ]	NE	NEC[ξ]
	N=81	*N=54*	*N=81*	*N=54*
Total Score				
168-135	3	3	14	3
134-113	16	17	25	27
112- 91	34	31	34	33
90- 69	38	31	15	31
68- 47	9	16	10	1
< 47	1	3	2	4
Milk				
48- 41	7	8	13	9
40- 33	3	3	9	6
32- 25	16	19	19	13
24- 17	11	13	10	17
16- 9	34	31	32	39
< 9	30	27	17	17
Meat				
24- 21	62	52	86	84
20- 17	25	31	3	11
16- 13	8	12	6	0
12- 9	4	3	4	3
8- 5	1	3	0	1
< 5	1	0	0	0
Vegetables				
48- 41	5	5	14	9
40- 33	11	9	17	9
32- 25	33	35	22	27
24- 17	27	19	22	26
16- 9	18	15	22	24
< 9	7	17	4	6
Bread				
48- 41	39	39	54	58
40- 33	23	27	14	11
32- 25	25	16	17	14
24- 17	9	16	6	11
16- 9	4	1	5	3
< 9	1	1	2	1
Vitamin A				
- 1	0	0	20	11
- 2	59	61	69	77
Vitamin C				
- 1	25	24	27	23
- 2	22	24	23	34
- 3	21	27	17	20

[ξ]Two teachers for nutrition education control classes were the same two who taught the nutrition education classes.

Table 9. Percentage of nutrition education (NE) and non-nutrition education (NEC) students obtaining various amounts of the recommended food groups in dietary recall data before and after nutrition education.

Group	Percent Possible Score	Fifth Grade				Seventh Grade				Tenth Grade			
		NE		NEC		NE		NEC		NE		NEC	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Milk	70 - 100	32	37	26	41	14	22	8	12	8	10	3	8
	55 - 69	23	34	27	19	23	25	23	23	4	9	8	7
	40 - 54	20	11	10	15	11	8	19	15	14	21	14	17
	< - 40	22	18	37	25	52	45	50	50	75	60	75	68
Meat	70 - 100	84	84	79	90	80	90	92	81	86	90	83	97
	55 - 69	8	10	8	6	9	2	4	12	7	7	12	10
	40 - 54	8	4	6	1	3	5	4	4	4	2	2	3
	< - 40	1	2	7	2	8	5	0	4	2	0	3	0
Fruits & Veg.	70 - 100	22	36	37	52	11	21	31	24	16	32	15	18
	55 - 69	27	20	33	20	17	13	31	15	33	24	34	27
	40 - 54	25	26	15	9	33	19	23	46	24	21	19	27
	< - 40	26	18	21	19	39	48	15	15	28	24	32	27
Bread	70 - 100	37	64	39	65	53	79	73	66	60	68	64	71
	55 - 69	25	16	21	17	23	13	23	27	26	17	15	15
	40 - 54	23	8	23	13	17	3	4	8	7	7	17	12
	< - 40	15	13	18	5	5	5	0	0	5	7	3	2
Vit. A[ξ]	100	33	40	24	58	35	25	39	11	41	11	39	12
	50	4	8	5	11	6	19	23	54	0	20	0	11
	0	63	52	71	31	50	56	38	35	59	69	61	77
Vit. C[ξ]	100	22	39	22	56	26	30	53	4	32	23	25	23
	67	22	17	17	17	27	28	12	15	25	27	24	23
	33	23	26	26	17	27	17	12	50	22	23	24	34
	0	33	18	35	10	20	25	23	31	21	17	27	20

[ξ]Based on number of servings recommended for the type A school lunch. Two servings of dark green or yellow vegetables during the three day period rated 100%; one serving each day of high vitamin C foods rated 100%.

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Table 10. Summary of Eastern Region food acceptability data, (Year A, 1970-71).

Food Item	Average Acceptability Scores by Groups									Overall Rating
	4th - 6th Grade			7th - 9th Grade			10th - 12th Grade			
	NE	Other	Total	NE	Other	Total	NE	Other	Total	
ENTREES										
A. Beef										
Beefaroni				3.65	3.59	3.60		3.86	3.86	3.69
Beef balls on rice with tomato		3.34	3.34		3.02	3.02				3.12
Beef patties	4.13	4.21	4.20	3.82	3.86	3.86				4.06
Beef stew	4.05	3.95	3.96		3.55	3.55	3.41	3.43	3.43	3.73
Chili burger	4.26	4.47	4.45	4.01	4.13	4.12				4.30
Chili con carne	3.60	3.27	3.28							3.28
Hamburger	4.11	4.32	4.31	3.93	4.09	4.07	3.07	3.44	3.42	4.02
Lasagne Casserole	3.80	3.24	3.29							3.29
Meat Cup							3.50	2.60	2.69	2.69
Meatballs		3.72	3.72		3.54	3.54				3.59
Meat Loaf				3.15	3.70	3.61		3.65	3.65	3.63
Pizza		3.51	3.51		3.92	3.92				3.80
Salisbury Steak		3.79	3.79	3.51	3.87	3.84		3.66	3.66	3.79
Sloppy Joe	4.67	4.27	4.32	4.32	4.13	4.15		4.26	4.26	4.22
Sloppy Joe with cheese	4.43	4.48	4.48	4.08	4.13	4.13				4.33
Spaghetti	4.24	4.23	4.23	3.84	3.98	3.96	3.96	4.10	4.09	4.10

[1] Score range is 1 to 5, with 5 being the highest (most acceptable) rating possible.

[2] "Other" refers to all children in 4th to 6th grade (7th to 9th, 10th to 12th) who rated the food with the exception of those 5th graders (7th and 10th) who were to be in the classes receiving nutrition education.

[3] Total is weighted average of both NE and Other. In all cases, there was a far greater number of "Other" ratings than of NE ratings.

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Table 10. Continued

Food Item	Average Acceptability Scores by Groups									Overall Rating
	4th - 6th Grade			7th - 9th Grade			10th - 12th Grade			
	NE	Other	Total	NE	Other	Total	NE	Other	Total	
B. Pork										
Sausage Pinwheels		3.19	3.19		3.12	3.12				3.14
Pork, barbecued	4.58	4.33	4.36							4.36
Pork, patties	4.51	3.99	4.04	3.83	3.54	3.57				3.94
D. Cured Meats										
Frankfurters, barbecued	4.06	4.24	4.22	3.37	3.58	3.57	3.58	3.38	3.39	3.77
Frankfurters, steamed							3.62	2.71	2.81	2.81
Ham, baked	4.51	4.32	4.34		3.57	3.57	4.00	2.84	2.85	4.00
Ham biscuits	4.56	4.33	4.35							4.35
Hot dogs	4.54	4.34	4.35	3.62	3.90	3.87	3.09	3.22	3.21	4.02
Vienna sausage							3.20	2.51	2.54	2.54
E. Poultry										
Chicken, baked		3.95	3.95		3.96	3.96				3.96
Chicken, barbecued	4.52	4.28	4.30	3.93	3.77	3.78	3.93	3.33	3.38	3.95
Chicken, fried	4.51	4.30	4.32	4.07	4.04	4.05		3.87	3.87	4.07
Chicken, oven fried		3.85	3.85		3.88	3.88				3.87
Chicken, pastry				4.21	3.49	3.75		3.46	3.46	3.60
Chicken salad	4.44	3.84	3.92							3.92
Chicken with dumplings	3.50	3.93	3.90	3.70	3.82	3.81				3.86
Chicken with rice					3.62	3.62		3.68	3.68	3.65
Turkey salad	3.50	4.09	4.04	3.56	3.94	3.88	3.40	3.75	3.74	3.90
Turkey on rice	4.00	3.97	3.97	3.78	3.70	3.70				3.80
Turkey with noodles		4.14	4.14		3.82	3.82				3.91

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Table 10, Continued.

Food Item	Average Acceptability Scores by Groups									Overall Rating
	4th - 6th Grade			7th - 9th Grade			10th - 12th Grade			
	NE	Other	Total	NE	Other	Total	NE	Other	Total	
F. Seafoods										
Fish	4.39	4.51	4.50	3.90	3.99	3.98	4.75	4.01	4.02	4.12
Fish sticks	3.87	4.04	4.02							4.02
Seafood dinner	3.35	3.51	3.49							3.49
Tuna fish salad				3.80	3.34	3.41	3.82	3.76	3.76	3.59
G. Other Entrees										
1. Sandwiches										
Boloburger	3.85	4.19	4.16	2.92	3.71	3.63				3.93
Bologna		4.19	4.19	3.78	3.66	3.68		3.67	3.67	3.82
Club		3.71	3.71		3.92	3.92				3.83
Peanut butter and jelly	3.80	4.18	4.14	3.64	3.77	3.74		3.36	3.36	3.80
Pimento and cheese	4.13	3.50	3.56	3.29	3.00	3.03		3.29	3.29	3.29
2. Soup										
Vegetable	4.03	4.09	4.09	3.98	3.92	3.93		3.74	3.74	3.96
4. Cheese										
Cheese	2.95	3.31	3.28	3.29	3.33	3.32		3.48	3.48	3.32
Macaroni and cheese							3.75	3.42	3.45	3.45
VEGETABLES										
A. Raw										
Cabbage slaw	3.51	3.23	3.26	2.72	2.76	2.76	3.37	3.30	3.31	3.11
Cabbage carrot slaw	2.83	2.70	2.71	2.49	2.62	2.60		3.17	3.17	2.67
Carrot sticks	3.89	3.60	3.63	2.90	3.20	3.17	3.08	2.78	2.80	3.50
Tossed salad	2.56	2.58	2.58	3.04	2.59	2.65				2.61

Table 10. Continued.

Food Item	Average Acceptability Scores by Groups									Overall Rating
	4th - 6th Grade			7th - 9th Grade			10th - 12th Grade			
	NE	Other	Total	NE	Other	Total	NE	Other	Total	
B. Cooked										
Beans, green	3.50	3.41	3.42	2.86	3.03	3.01	3.06	2.86	2.88	3.18
Beans, green with tomatoes		2.62	2.62		2.59	2.59				2.60
Beans, lima	3.66	2.09	3.13	3.23	2.93	2.96	2.82	2.75	2.75	2.97
Beans, lima with corn					2.83	2.83		2.88	2.88	2.87
Beans, navy	3.11	3.10	3.10	2.80	2.93	2.93		3.03	3.03	2.99
Beans, mixed dried (baked)	3.60	3.10	3.16	3.32	3.63	3.47	2.80	2.52	2.54	3.11
Beets, pickled	1.83	2.59	2.54	3.12	2.44	2.50	2.02	2.41	2.39	2.47
Broccoli	2.81	1.80	1.94							1.94
Brussel sprouts	2.62	1.91	1.98							1.98
Cabbage, steamed	3.32	2.78	2.82	2.83	2.71	2.71	3.00	2.85	2.86	2.78
Carrots, buttered				2.29	2.20	2.22		2.67	2.67	2.37
Carrots, glazed				2.07	1.85	1.89		2.32	2.32	2.00
Corn	4.22	3.80	3.83	3.27	3.65	3.65	3.33	3.19	3.20	3.71
Greens, collards	3.64	2.84	2.92	3.04	2.32	2.37		3.03	3.03	2.69
Greens, turnips (mixed)	2.72	2.77	2.76	2.47	2.38	2.39	2.76	2.71	2.72	2.57
Peas, field	3.25	3.07	3.08	2.70	2.75	2.75	2.84	2.72	2.73	2.86
Peas, green	3.68	3.27	3.30	2.96	2.96	2.96	3.08	3.06	3.06	3.10
Peas with carrots	2.97	2.51	2.56							2.56
Potatoes	4.09	3.86	3.88	3.58	3.49	3.51		3.28	3.28	3.59
Potatoes, boiled	4.00	4.00	4.00	3.50	3.53	3.52		2.94	2.94	3.58
Potatoes, in jackets (baked)		3.38	3.38		3.29	3.29				3.31
Potatoes, chantilly	3.26	3.94	3.88	3.36	3.40	3.40				3.66
Potatoes, french fries	4.56	4.25	4.28	4.16	3.94	3.97	4.40	4.03	4.04	4.10
Potatoes, mashed	3.66	3.64	3.64	3.47	3.48	3.48	3.54	3.47	3.47	3.53
Potatoes, salad	4.01	3.41	3.46				2.67	3.00	2.99	3.41
Sweet potatoes, candied		3.21	3.21	3.56	2.97	3.01	3.55	3.34	3.34	3.17
Sweet potatoes, whipped	2.96	3.26	3.23	3.13	2.97	2.99		3.57	3.57	3.15
Vegetables, mixed		2.31	2.31		2.47	2.47				2.43

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Table 10, Continued.

Food Item	Average Acceptability Scores by Groups									Overall Rating
	4th - 6th Grade			7th - 9th Grade			10th - 12th Grade			
	NE	Other	Total	NE	Other	Total	NE	Other	Total	
B. Vegetable substitutes										
Grits				3.45	3.42	3.44				3.44
Rice, buttered	3.64	3.66	3.66	2.97	3.18	3.16	2.67	3.29	3.26	3.36
Rice with gravy	3.81	3.64	3.66	3.26	3.28	3.28				3.51
FRUITS										
A. Uncooked										
Apple		4.27	4.27	3.55	3.90	3.88				4.02
Orange	4.61	4.45	4.46	4.03	4.00	4.00				4.21
B. Cooked										
1. Whole										
Apples, baked	3.73	3.64	3.65	3.30	3.16	3.17				3.42
Apricot, halves	2.85	3.17	3.15	2.41	2.87	2.84	2.63	2.51	2.52	2.83
Grapefruit sections	3.19	3.42	3.40	2.93	2.90	2.91		3.11	3.11	3.10
Peaches	4.26	4.14	4.15	3.73	3.70	3.70	3.34	3.64	3.63	3.81
Pear salad with cheese					2.62	2.62				2.62
Prunes				2.66	2.95	2.93	3.22	2.90	2.92	2.93
2. Not whole										
Applesauce	4.17	4.10	4.11	3.50	3.71	3.69	3.48	3.45	3.45	3.88
Apples, fried	3.15	3.15	3.15							3.15
Cranberry sauce	2.47	2.53	2.52	3.03	2.69	2.72	2.67	2.92	2.91	2.72
Cranberry-apple relish	2.67	2.34	2.37	1.83	1.67	1.69				2.05
Fruit cup	4.03	3.97	3.98	3.51	3.27	3.31	3.14	3.47	3.47	3.56
4. Congealed										
Cranberry salad		2.82	2.82		2.56	2.56				2.64
Fruited jello		3.78	3.78		3.81	3.81				3.80
Fruited jello with cranberry sauce salad				3.22	3.67	3.43				3.43

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Table 10. Continued.

Food Item	Average Acceptability Scores by Groups									Overall Rating
	4th - 6th Grade			7th - 9th Grade			10th - 12th Grade			
	NE	Other	Total	NE	Other	Total	NE	Other	Total	
5. Concocted cooked										
Apple cobbler	4.10	3.63	3.68	3.84	3.49	3.54		3.85	3.85	3.65
Banana pudding	4.54	4.00	4.05							4.05
Peach cobbler	3.88	3.73	3.75							3.75
6. Juices										
Orange	4.65	4.16	4.19	3.85	3.76	3.76		3.60	3.60	3.85
BREADS										
A. Yeast										
1. Plain										
Rolls, plain	4.05	4.01	4.02	3.53	3.58	3.58	3.16	3.31	3.30	3.68
Rolls, whole wheat		3.66	3.66		3.48	3.48				3.52
Rolls, split with toasted cheese		3.82	3.82		3.63	3.63				3.69
French bread	4.16	3.97	3.99							3.99
Hamburger bun				4.08	3.93	3.95		3.89	3.89	3.93
2. Sweet										
Cinnamon bun	4.35	4.32	4.35	3.90	3.86	3.86	3.93	3.78	3.79	4.21
Cinnamon-prune bun		4.23	4.23		4.09	4.09				4.13
Doughnut	4.30	4.53	4.52	4.04	3.81	3.83	3.17	3.27	3.26	3.92
Honey bun				4.14	4.20	4.19	3.25	3.40	3.39	3.96
B. Quick										
Biscuits				3.87	3.73	3.76		3.78	3.78	3.77
Cornbread	3.79	3.43	3.45	3.86	3.28	3.31	3.39	3.16	3.17	3.33
Crackers, saltine	4.14	4.23	4.22	3.78	3.84	3.83		3.60	3.60	3.97
Crackers, graham							4.25	2.96	3.06	3.06
Crackers, graham with peanut butter	4.17	4.26	4.25	3.40	3.64	3.62				3.92
Hush puppies	3.56	3.39	3.41	3.73	3.39	3.58				3.45

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Table 10. Continued.

Food Item	Average Acceptability Scores by Groups									Overall Rating
	4th - 6th Grade			7th - 9th Grade			10th - 12th Grade			
	NE	Other	Total	NE	Other	Total	NE	Other	Total	
C. Cake										
Chocolate	4.74	4.64	4.64	3.85	3.90	3.90		3.62	3.62	4.28
Chocolate with peanut butter icing					3.91	3.91				3.91
Chocolate, rolled wheat	4.45	4.08	4.12	4.21	4.07	4.12		3.76	3.76	4.04
Gingerbread		3.90	3.90	3.93	3.51	3.58		3.55	3.55	3.61
Lemon	4.57	4.26	4.29							4.29
Oatmeal	4.20	4.02	4.04		3.43	3.43				3.86
Plain	4.36	4.23	4.25	4.06	3.95	3.96	3.83	3.59	3.60	4.07
Plain, iced sheet	4.63	4.38	4.40	4.15	3.94	3.98		4.01	4.01	4.08
Plain, lemon icing		4.28	4.28		4.31	4.31				4.30
Plain, peanut butter icing				3.80	3.87	3.86		3.43	3.43	3.70
Plain, pineapple icing	4.44	4.50	4.49	4.35	4.02	4.05				4.24
Prune, spice	4.58	3.95	4.02		3.25	3.25				3.84
Spice	3.97	3.53	3.65							3.65
Shortcake, pineapple	4.04	4.24	4.22	3.48	3.44	3.44				3.89
Shortcake, strawberry	4.62	4.43	4.45		4.53	4.53				4.47
D. Cookies										
Assorted		4.11	4.11	4.02	4.03	4.03	3.10	3.53	3.51	3.89
Brownie	4.56	4.13	4.16	3.13	3.87	3.70	3.27	3.45	3.44	3.72
Commercial		4.64	4.64							4.64
Oatmeal-Raisin				4.00	4.17	4.14				4.14
Peanut butter		4.31	4.31	3.74	4.09	4.05				4.10
Peanut butter delight	3.97	4.21	4.20		4.07	4.07				4.18
Plain				3.97	3.92	3.93	3.69	3.63	3.63	3.74
Raisin	3.88	3.99	3.98	3.48	3.55	3.54				3.76
Raisin Bar	3.79	4.02	4.00	3.46	3.65	3.62	3.25	2.53	2.57	3.68
Snow Rocket, Plain		4.22	4.22		4.23	4.23				4.23

8th/Lth

Table 10. Continued.

Food Item	Average Acceptability Scores by Groups									Overall Rating
	4th - 6th Grade			7th - 9th Grade			10th - 12th Grade			
	NE	Other	Total	NE	Other	Total	NE	Other	Total	
F. Other										
1. Candy										
Chocolate mound type		4.24	4.24		4.03	4.03				4.09
Peanut butter ball					3.71	3.71				3.71
2. Congealed										
Jello	4.61	4.24	4.27	3.87	3.72	3.73		3.61	3.71	3.99
Gelatin dessert with topping	4.42	4.05	4.09							4.09
BEVERAGE										
Milk, whole	4.53	4.23	4.26	3.78	3.93	3.91	4.00	4.01	4.01	4.08
Milk, chocolate and whole		4.55	4.55		4.29	4.29				4.37

before and after nutrition classes. A partial summary of results is presented in Table 11.

Food Consumed

A partial summary of food consumption data is presented in Table 12. Data shown here allow comparison of amounts of nutrients consumed, as determined by laboratory nutrient analyses, by students in nutrition education groups and non-nutrition education groups. Comparisons can be made of amounts of refuse from nutrition education and control groups in October and April by examination of Table 13.

Table 11. Student attitude subscale means[♦] by class and treatment (1970-71).

Group[▼]	School	Class	No. of Students	Grade	SUBSCALE: School lunch Pre	School lunch Post[<]	Administration Pre	Administration Post[<]	Facilities Pre	Facilities Post[<]	Program Pre	Program Post[<]	Sensitivity Pre	Sensitivity Post[<]	Transportation Pre	Transportation Post[<]
C_1	1	a	19	5	2.83	-.50	3.86	-.29	3.30	-.25	3.50	-.25	3.58	-.26	3.12	+.04
		b	25		3.20	-.27	3.95	+.06	3.66	-.18	3.67	-.03	3.77	+.04	3.15	+.06
	2	a	21	5	3.41	-.31	3.64	-.06	3.40	+.11	3.53	+.13	3.51	+.06	3.40	-.03
		b	25		3.60	-.34	4.03	+.06	3.84	-.25	3.86	-.09	3.86	+.07	3.64	-.21
		c	19		3.43	.00	3.67	+.43	3.57	+.08	3.40	+.36	3.58	+.44	3.44	+.10
		d	22		3.48	-.50	3.63	-.04	3.48	-.25	3.59	-.01	3.67	-.18	3.45	-.29
		e	18		3.54	-.64	4.11	-.42	3.53	-.30	3.90	-.30	3.80	-.26	3.29	+.13
	7	a	31	7	3.24	-.21	3.43	-.15	3.17	-.18	3.45	+.02	3.43	.00	3.39	-.07
		b	23		3.33	-.37	3.50	-.21	3.27	-.32	3.46	+.05	3.59	-.28	3.21	-.17
		c	36		3.32	-.44	3.53	-.24	3.06	-.40	3.48	-.24	3.46	-.13	3.41	-.33
	8	a	49	7	3.43	-.48	3.78	-.20	3.45	-.30	3.60	-.19	3.59	-.07	3.29	.00
C_2	3	all classes	75	5	3.43	-.26	3.83	+.03	3.55	-.05	3.57	+.06	3.59	+.07	3.16	+.03
	4	all classes	58	5	3.36	-.16	3.80	+.11	3.50	-.03	3.55	-.02	3.58	-.01	3.18	-.01
	9	all classes	67	7	3.36	-.31	3.88	-.22	3.80	-.13	3.72	-.14	3.77	-.06	3.38	-.18

♦ Attitude score range is 1 to 5, with 5 the highest (most desirable) score possible.

▼ C_1 Treatment included only attitude measurement.
C_2 Treatment included attitude and food refuse measurement, and opportunity to rate acceptability of food.
C_3 Within school control; same as C_2 except classes were in schools which also had full experimental classes
E Treatment included attitude and food refuse measurement, nutrition education, and opportunity to rate acceptability of food.

< Differences between pre (October, 1970) and post (April, 1971) scores.

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Table 11. Continued

Group[V]	School	Class	No. of Students	Grade	SUBSCALE: School lunch Pre	School lunch Post[X]	Administration Pre	Administration Post[X]	Facilities Pre	Facilities Post[X]	Program Pre	Program Post[X]	Sensitivity Pre	Sensitivity Post[X]	Transporation Pre	Transporation Post[X]
	10	all classes	86	7	3.25	-.26	3.50	-.13	3.49	-.12	3.41	-.04	3.46	-.06	3.47	-.01
	14	all classes	67	10	3.51	-.39	3.86	-.10	3.48	-.28	3.60	-.07	3.87	-.10	3.56	-.24
C_3	5	a	28	5	3.37	-.22	3.64	-.03	3.25	-.19	3.55	-.06	3.49	+.07	3.12	+.04
		b	22	5	3.45	-.10	3.93	-.01	3.52	-.09	3.74	-.14	3.65	-.02	3.18	+.02
	6	a	19	5	3.18	-.34	3.74	+.37	3.22	+.04	3.64	-.03	3.67	-.13	3.10	-.03
	11	a	33	7	3.40	-.22	3.59	-.30	3.49	-.29	3.46	+.02	3.51	+.04	3.27	-.07
	12	a	88	7	3.24	-.34	3.81	-.30	3.75	-.14	3.44	-.11	3.68	-.23	3.31	-.15
	13	a	141	10	2.87	-.20	3.49	-.19	3.50	-.17	3.48	-.13	3.49	+.02	3.24	-.02
E	5	c	28	5	3.47	-.43	3.67	-.12	3.34	-.53	3.51	-.10	3.50	.00	3.31	-.10
		d	24	5	3.23	+.36	3.72	+.43	3.20	+.29	3.44	+.45	3.61	+.41	2.91	+.38
	6	b	19	5	3.48	-.15	4.17	-.03	3.76	-.10	3.91	-.17	3.98	-.15	3.24	+.01
		c	23	5	3.67	-.35	4.07	-.25	3.72	-.27	4.03	-.22	4.12	-.40	3.56	-.19
	11	b	44	7	3.24	-.18	3.46	-.04	3.26	-.16	3.50	+.04	3.47	+.05	3.26	+.01
	12	b	44	7	3.23	-.32	3.89	-.14	3.71	-.11	3.56	-.13	3.61	-.05	3.21	-.05
	13	b	34	10	3.03	-.15	3.53	-.05	3.50	-.09	3.48	+.01	3.48	+.05	3.33	-.01
	13	c	40	10	2.87	-.20	3.42	-.20	3.47	-.21	3.34	-.17	3.43	-.11	3.16	-.04

Table 12. Nutrients consumed[V] in school lunches from nutrition education (NE) and non-nutrition education (NEC) students, before and after nutrition education (1970-71), expressed by weight and as percentage of the amount served.

School-level	Period	Group	Fat		Protein		Calories		Ascorbic Acid		Thiamine		Ribo-flavin		Vit. A		Iron		Calcium	
			g	%	g	%	g	%	mg	%	mg	%	mg	%	IU	%	mg	%	mg	%
5th Grade																				
Baskerville	Pre		28.1	89	24.0	89	530	95	3.0	88	.30	86	.55	86			3.24	85	320	84
	Post		28.6	89	27.6	93	556	88	3.2	67	.41	89	.58	87	1099	82	3.90	85	320	86
Bailey	Pre		27.4	81	21.4	79	463	78	16.5	76	.29	83	.57	85	2070	76	4.17	83	380	86
	Post		22.8	83	23.8	87	497	81	4.4	60	.41	85	.64	85	1241	59	3.36	77	330	83
Braswell	Pre	NE	22.9	76	20.9	71	424	70	2.8	61	.30	71	.57	73			3.26	65	310	72
		NEC	20.9	69	20.6	70	400	66	3.5	76	.30	71	.58	74	1033	23	3.22	65	310	72
	Post	NE	24.8	74	24.1	75	531	74	6.4	67	.37	77	.70	80	1617	74	6.86	75	320	78
		NEC	24.1	72	24.2	75	522	73	6.0	62	.36	75	.71	81	1387	63	6.38	70	310	76
Nashville	Pre	NE	28.3	81	27.1	87	609	84	5.9	60	.36	88	.67	91	4041	86	4.24	81	360	88
		NEC	31.6	91	28.2	90	646	89	8.1	83	.37	90	.68	92	4205	90	4.61	88	370	90
	Post	NE	26.4	99	26.1	99	573	98	15.0	92	.34	97	.71	99	1845	87	4.19	97	410	98
		NEC	26.1	97	26.0	98	569	98	14.3	88	.34	97	.70	97	1749	83	4.17	97	410	98
7th Grade[1]																				
Goldsboro	Pre	NEC	31.8	84	27.2	87	527	81	3.8	78	.31	78	.67	86	1453	80	3.87	75	360	86
	Post	NEC	25.3	84	32.4	88	542	84	13.9	77	.31	82	.70	86	330	32	3.42	80	330	85
W. Edgecombe	Pre	NE	24.7	80	29.5	87	513	84	20.7	69	.29	85	.61	86	2540	62	3.61	79	340	81
		NEC	27.0	88	30.0	88	532	87	24.1	81	.30	88	.63	89	2966	72	3.65	80	360	86
	Post	NE	29.8	97	29.5	98	661	97	4.0	33	.36	97	.86	98	3987	60	5.56	97	420	98
		NEC	30.0	98	29.6	99	663	98	7.2	58	.36	97	.87	99	4401	66	5.59	98	420	98
Parker	Pre	NE(girls)	33.8	86	23.9	78	534	80	2.8	76	.32	80	.52	83	2454	57	3.23	71	290	76
		NEC "	33.7	86	25.0	81	534	80	2.9	78	.33	83	.53	84	2344	55	3.32	73	310	82

[V] values are actual amounts obtained by laboratory analyses.

[1] data from S. Edgecombe omitted; data was invalidated by student exchange of food.

95/55

Table 12.Continued

School-level	Period	Group	Fat		Protein		Calories		Ascorbic Acid		Thiamine		Ribo-flavin		Vit. A		Iron		Calcium	
			g	%	g	%	g	%	mg	%	mg	%	mg	%	IU	%	mg	%	mg	%
		NEC(boys)	36.3	92	27.4	89	596	89	3.2	86	.36	90	.58	92	2946	69	3.87	85	340	89
	Post	NE(girls)	33.6	82	29.3	81	587	76	6.8	61	.43	77	.64	79	1477	75	4.38	74	350	81
		NEC "	34.0	83	30.2	83	594	77	7.8	69	.44	79	.63	78	1583	81	4.29	72	360	84
		NEC(boys)	37.4	91	33.3	92	682	89	8.8	78	.50	89	.72	89	1729	88	5.10	86	390	91
10th Grade																				
Phillips	Pre	NEC	34.4	87	30.3	90	607	85	23.0	92	.30	86	.61	88	2077	69	5.33	98	370	86
	Post	NEC	29.1	85	30.4	88	611	83	14.0	84	.32	86	.75	89	4752	63	4.15	81	370	88
Rocky Mount	Pre	NE	30.1	88	24.6	90	502	86	6.9	91	.30	83	.53	87	871	83	3.58	84	310	89
		NEC	30.4	89	25.0	91	515	88	6.9	91	.31	86	.55	90	828	79	3.70	87	320	91
	Post	NE	40.0	90	29.3	90	730	89	27.5	93	.40	91	.62	87	1207	56	3.52	80	350	85
		NEC	40.5	92	29.4	90	736	90	27.6	93	.40	91	.62	87	1448	67	3.53	80	360	88

Table 13. Comparison of amount of refuse from nutrition education (NE) and non-nutrition education (NEC) students in October and April.

School	October			April		
	Tray Wt. (g)	Percent Refuse		Tray Wt. (g)	Percent Refuse	
		NE	NEC		NE	NEC
			Fifth Grade			
Bailey	571		18.9	561		19.7
Nashville	596	15.5	10.3	566	10.5	14.3
Braswell	623	31.3	33.1	684	22.6	28.1
Baskerville	517		16.2	562		16.1
			Seventh Grade			
Goldsboro	609		21.6	602		17.8
North Edgecombe	578	18.6	16.0	656	18.0	15.3
Parker	578	22.7	24.6 (girls) 13.2 (boys)	617	25.1	24.1 (girls) 13.2 (boys)
			Tenth Grade			
Phillips	591		13.6	656		17.9
Rocky Mount	589	12.6	11.7	578	15.5	11.7

Nutrition Education

Year II

RATIONALE

The nutrition education program implemented during the 1970-71 school year in selected fifth, seventh, and tenth grade classes from three administrative units has provided data valuable for projecting directions for an ongoing educational program which may improve food habits of children. Students, prior to implementation of the project, had generally been exposed to very limited experiences in nutrition education with little regard to sequential development of concepts. A real difficulty in initiating a nutrition education program in advanced grade levels was complete lack of consistency in prior instructional experiences of students and in the approach used by teachers.

Conducting a nutrition education program in primary grades within several schools in one administrative unit should provide opportunities for: teachers to frequently share progress of project activities and use of instructional materials; coordination of instructional activities by local administrative personnel; organization of in-service programs for a more homogenous grouping; control of instructional activities for project grades; and expanded involvement of parents and community in project activities.

Early involvement of students in introductory experience in nutrition concepts and in food selection may result in expanded acceptability of foods. A necessary aid to teachers unaccustomed to teaching nutrition is development of a curriculum guide which illustrates sequential development of nutrition concepts appropriate to the age level taught. Inclusion of parents and community resources in this program will offer the child important reinforcement of concepts.

A nutrition education coordinator was employed. It was believed that a coordinator housed in the state department could more effectively work with school districts and teachers than one who was not associated with the state department. The coordinator was employed as a consultant in the Consumer and Homemaking Division of the State Department of Education; however her position was totally supported by the research project.

This was a cooperative venture of North Carolina State University and the State Department of Education and it was necessary to delineate specific responsibilities of each.

METHODOLOGY

In addition to employing a full time coordinator, plans included development of a curriculum guide, and conducting a training workshop for teachers prior to implementation of the nutrition education classes for first through third grade students. Pre and post measures (before and after nutrition education) were obtained of weights of refuse of individual food items by groups of student trays. Cognitive tests were given to students in experimental and control groups at the conclusion of the experiment.

Curriculum Guide

A curriculum guide for kindergarten through grade three was developed under the direction of the Consumer and Homemaking Department of the State Department of Education. A university faculty member in the Foods and Nutrition Department at the University of North Carolina at Greensboro developed the guide. It was reviewed in process by the director of Early Childhood Education at the State Department of Education.

The guide used the concept approach to learning. It contained six major ideas, each broken down into basic concepts.

Sample

Two school districts, Goldsboro City and Alamance County, were selected to participate in the study. Permission was obtained from the superintendents, and cooperation of the school lunch supervisors, elementary supervisors, and principals was gained.

In each area, schools were designated as experimental or control. In Goldsboro there were two experimental schools and one control school;

in Alamance, three experimental and one control school. Approximately 2500 students comprised the experimental and control samples. All teachers of grades one to three in experimental schools were required to participate in the project, yielding a total of 55 teachers involved.

In-Service Training

During October, four two-hour workshops were held for teachers in each district. They were oriented to the project and given background in basic nutrition. Most of the time was spent familiarizing teachers with the curriculum guide. Emphasis was placed on how to teach nutrition to the primary school student.

Each teacher was given a curriculum guide. Funds were made available to each school to purchase books, films, and other teaching aids. Additional funds were allocated for each teacher to purchase food for tasting. Control schools received neither funds nor training.

Implementation of the Curriculum Guide

Nutrition education classes were secheduled to begin after collection of preliminary data on refuse. At the close of the workshops, teachers were urged to begin teaching nutrition immediately. The nutrition education coordinator began her visitation schedule with each school. During these visits, individual help was given to teachers and questions were answered. The coordinator visited classrooms to observe activities and talk with the students. At no time, however, did she teach nutrition to the students.

Evaluation

The two methods of evaluation used were refuse collection and post-testing. Purpose and procedure for each are described below.

Refuse Collection

Refuse collection was used to determine possible change in eating habits of students after nutriton education. Plate waste was collected from experimental and control students on three days during October. The days were chosen according to menus planned. In order to enable measurement of change, menus that were generally unpopular were chosen.

A team of trained collectors was assigned to each school. To determine weight of each food served, four trays were taken from students after they had passed through the serving line. Each food item was put into a separate container and weighed. An average weight per serving of each item was obtained.

At completion of the meal, a random sample of trays was collected as children returned trays to the cleanup area. Plate waste for each food item was put into a labeled container. A minimum of 80 trays was collected from an approximately even distribution of students from first to third grade. An average weight of refuse per student for each food item was determined. Amount of food consumed was calculated by difference, i.e., weight of food served minus weight of refuse, per tray. Refuse for one day was collected separately for first, second, and third grade students in Alamance County in order to determine possible differences between grade levels. The different grade structure of schools in Goldsboro rendered some division of data by grade level possible.

Refuse collection was repeated again in April after nutrition had been taught in the experimental schools. Menus identical to those served in October were used. Comparisons were made between amount of food eaten in October and April. Exact procedures followed in refuse collection are described in Appendix D.

Cognitive Nutrition Test

A cognitive nutrition posttest was administered to students in experimental and control schools. The test constructed by the nutrition education coordinator specifically for the project, is shown in Appendix E.

Concepts and learning activities in the curriculum guide served as a basis for construction of test items. All items were multiple choice questions with response alternatives presented in picture form. Since the teacher read the item and the student circled the appropriate picture differences due to reading ability were eliminated.

In both experimental and control schools teachers were orally instructed in method for administering the test. In addition, a detailed instruction sheet was included with the test. Teachers did not see the test until dates set for testing.

Teachers were given a choice of two days for administering the test. Teachers returned completed tests to the principal's office, from which they were returned to the Department of Education. All tests were scored by the nutrition education coordinator.

RESULTS AND DISCUSSION

Nutrition Experiences

Some teachers were more interested than others and were more thorough and creative in their teaching of nutrition; all used the curriculum guide, and many followed it exactly. Others used the guide as a reference for ideas. One of the most difficult problems to overcome was the teachers' desire to teach nutrition as a unit rather than to integrate it into other curriculum areas.

At the beginning of the year, the teachers voiced concern over their lack of training in nutrition. They became more enthusiastic as the year progressed and as their interest and knowledge increased.

Structure in experimental schools ranged from the self-contained, graded classroom to the open, non-graded school. The approach to teaching nutrition varied with the individual situation. In a school where time was blocked (teachers had different students for different subjects), teachers felt that they could not teach as much nutrition as teachers who had the same children all day. In the open classroom, non-graded school, teachers worked in teams, and most activities included the entire school.

The nutrition coordinator visited each project school at least once during the first six weeks. A variety of activities was observed, several of which are described below.

A second grade teacher began a study of nutrition with foods in the bread and cereal group. The class visited a bakery to see how bread and other bakery products were made. The study of bread and cereal products was integrated with all other areas of the curriculum. A few examples taken from the teacher's activity plan follow: (1) reading--write activity charts about food and read them; read stories

about food; (2) math--perform number problems about food; teach measurements (1/2 cup, 1 dozen, etc.); tell time it takes to bake bread; (3) spelling--spell words that were used in lesson on foods. To complete the study of the bread and cereal group, the class made bread.

Several first grade classes planned, cooked, served, and ate breakfast in the classroom. Tasting parties were held in a number of classrooms. Fruits and vegetables were the most frequent foods used, with emphasis placed on vegetables, since they are less popular.

During the months of January, February and March, the nutrition education coordinator visited each participating school.

The tasting party continued to be one of the more popular activities. Some teachers prepared the food ahead of time; after talking about each food, they passed the tray of food for tasting. Other teachers brought the food into the class as purchased for examination.

Using another approach, one teacher separated the class into small groups. Each group received a food to "discover". They were told to use all their senses and describe each food on paper. When the class assembled, the students shared their discoveries.

During the project, teachers worked with their students in the lunchroom to encourage better eating habits. Many teachers reported that children were more willing to try foods they would not have tried earlier in the year.

Nutrition was often incorporated into art lessons. As food and food groups were studied, student drawings and mobiles decorated the rooms.

Upon completion of the project, teachers felt that nutrition education had a beneficial effect on students' eating habits. Many reported that students were less noisy in the lunchroom; they were more willing to try new

foods; they made an effort to eat previously disliked foods; and they voiced fewer complaints.

Refuse

From refuse data analyses, no distinct pattern of change in eating habits was detected in experimental schools; nor were there differences between experimental and control schools after nutrition education. There were no differences due to grade level in Alamance County as shown in Tables 14 and 15.

In one case consumption of cole slaw and apricots increased in the experimental school and decreased in the control school. Milk consumption generally increased after nutrition education. Consumption of many food items, however, also increased in control schools.

Lack of differences may have been caused by several factors. There was large variation in amount of food served to students. For example, during the October refuse collection in Alamance County, a cheese stick was served; the average weight of cheese in each of the four schools was: 24 grams, 7 grams, 22 grams, and 10 grams. Such variation was common. This variability in amount of food served makes any kind of analysis difficult, and makes drawing conclusions almost impossible. Refuse data are shown in Tables 16, 17, 18, and 19. A summary of total weights of food consumed per student, pre and post nutrition education is given in Table 19a.

During the April refuse collection, one data collector noticed some teachers urging students to eat all food on their trays. An effort was made to prevent this from happening again; however, this fact adds another element of doubt as to reliability of refuse data.

Cognitive Nutrition Test

Posttest results were analyzed several ways. Percentage of students responding correctly to each item was determined for experimental and control

Table 14. Comparison of average weights of food as served and refuse per student for first, second, and third year students in Alamance County schools, October 28, 1971.

School	Food Item	First			Second & Third			First, Second & Third		
		Food Served[ξ]	Refuse	Food Eaten	Food Served[Ψ]	Refuse	Food Eaten	Food Served[§]	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal		
		N=27			*N=53*			*N=80*		
Saxapahaw	Meat Loaf w/ Tomato Sauce	64	18	46	73	25	48	68	23	45
	Whipped Potatoes	121	53	68	152	78	74	137	69	68
	Green Beans	48	26	22	41	22	19	45	23	22
	Hot Rolls	38	12	26	32	9	23	35	10	25
	Gelatin Dessert w/ Whipped Topping	78	5	73	84	9	75	81	8	73
	Milk	239	131	108	248	95	153	243	107	136
		N=28			*N=56*			*N=84*		
South Mebane	Meat Loaf w/ Tomato Sauce	52	13	39	67	14	53	59	14	45
	Whipped Potatoes	51	28	23	84	30	54	68	30	38
	Green Beans	35	10	25	32	12	20	34	11	23
	Hot Rolls	31	9	22	26	7	19	28	8	20
	Gelatin Dessert w/ Whipped Topping	73	16	57	71	14	57	72	15	57
	Milk	246	85	161	247	81	166	246	82	164

[ξ]Average weight of food items on two trays served to first year students.

[Ψ]Average weight of food items on two trays, one served to second year student and one to third year student.

[§]Average weight of food items on the four trays sampled.

69/70

Table 14.Continued

School	Food Item	First			Second & Third			First, Second, & Third		
		Food Served[ξ]	Refuse	Food Eaten	Food Served[ψ]	Refuse	Food Eaten	Food Served[§]	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal		
		N=26			*N=54*			*N=80*		
North Graham	Meat Loaf w/ Tomato Sauce	88	35	53	71	20	51	80	25	55
	Whipped Potatoes	85	51	34	103	51	52	94	51	43
	Green Beans	40	24	16	51	23	28	50	23	27
	Hot Rolls	68	16	52	41	13	28	54	14	40
	Gelatin Dessert w/ Whipped Topping	86	22	64	88	11	77	87	14	73
	Milk	244	111	133	244	84	160	244	92	152
		N=27			*N=54*			*N=81*		
Haw River	Meat Loaf w/ Tomato Sauce	78	32	46	79	33	46	78	33	45
	Whipped Potatoes	101	38	63	68	28	40	85	32	53
	Green Beans	43	23	20	39	17	22	41	19	22
	Hot Rolls	35	14	21	51	12	39	43	13	30
	Gelatin Dessert w/ Whipped Topping	80	22	58	78	20	58	79	21	58
	Milk	237	101	136	237	70	167	237	80	157

71/72

Table 15. Comparison of average weights of food as served and refuse per meal for first, second and third year students in Alamance County Schools during April 1972.

School	Food Item	First			Second & Third			First, Second & Third		
		Food Served[ξ]	Refuse	Food Eaten	Food Served[Ψ]	Refuse	Food Eaten	Food Served[ψ]	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal		
			N=26			*N=54*			*N=80*	
Saxapahaw[Φ]	Meat Loaf	58	23	35	83	18	65	70	20	50
	Whipped Potatoes	117	51	66	124	59	65	120	56	64
	Green Beans	41	21	20	44	16	28	42	18	24
	Rolls	42[←]	13	29	58[<]	13	45	50	13	37
	Gelatin Dessert w/ whip topping	80	8	72	103	11	92	91	10	81
	Milk	244	103	141	254	84	170	248	91	157
			N=30			*N=56*			*N=86*	
South Mebane	Meat Loaf[λ]	71	27	44	73	12	61	72	17	55
	Whipped Potatoes	84	58	26	98	41	57	91	47	44
	Green Beans	41	14	27	36	17	19	38	16	22
	Rolls	38[¶]	3	35	36	6	30	40	5	35
	Gelatin Dessert w/ whip topping	80	79	1	78	20	58	79	41	38
	Milk	267	88	179	266	66	200	267	74	193

[ξ] average wt. of food items on 2 trays served to first year students.

[Ψ] average wt. of food items on 2 trays, one served to a second year student and one to a third year student.

[ψ] average wt. of food items on the 4 trays sampled. [Φ] ice cream could be purchased

[←] one roll served on first grade student tray

[<] choice of one or two rolls for second grade student, two rolls served to third grade student.

[λ] meatloaf served without sauce [¶] Rolls served to last students during serving period were burned.

73/74

Table 15. Continued

School	Food Item	First			Second & Third			First, Second & Third		
		Food Served[ξ]	Refuse	Food Eaten	Food Served[Ψ]	Refuse	Food Eaten	Food Served[Ψ]	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal		
			N=27			*N=53*			*N=80*	
North Graham	Meat Loaf	96	34	62	82	34	48	89	34	55
	Whipped Potatoes	92	33	59	76	42	34	84	39	45
	Green Beans	51	15	36	36	20	16	43	18	25
	Rolls	49	11	38	46[†]	16	30	47[>]	14	33
	Gelatin Dessert w/ whip topping	119	18	101	73[†]	14	59	96[>]	15	81
	Milk	247	118	129	248	94	154	248	102	146
			N=25			*N=55*			*N=80*	
Haw River	Meat Loaf	88	24	64	91	29	62	89	28	61
	Whipped Potatoes	103	15	88	102	28	74	102	24	78
	Green Beans	36	20	16	51	15	36	43	17	26
	Rolls	34	16	19	33	11	22	33	12	21
	Gelatin Dessert w/ whip topping	68	8	60	70	8	62	69	8	61
	Milk	237	81	156	240	51	189	238	60	178

[†] without topping

[>] with and without topping

Table 16. Summary of average weights of food as served[ξ] and refuse per meal[Ψ] for first, second, and third year students in Alamance County schools during October 1971.

Date	Food Item[Ψ]	Saxapahaw (Exp)			South Mebane (Exp)			North Graham (Exp)			Haw River (Control)		
		Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal			grams per meal		
			N=81[λ]			N=84			N=81			N=81	
Oct. 20	Vienna Sausage	32	3	29	30	4	26	26	2	24	27	2	25
	Pork & Beans	81	29	52	66	10	56	68	28	40	104	14	90
	Cole Slaw	68	60	8	46	31	15	69	40	29	85	34	51
	Corn Bread	49	20	29	27	10	17	33	20	13	58	26	32
	Apricots	46	11	35	46	17	29	36	17	19	59	21	38
	Cookies	8[←]	0	8	12[←]	0	12	34[<]	10	24	21[Φ]	2	19
	Milk	240	93	147	247	48	199	256	94	162	238	41	197
			N=80			N=84			N=80			N=82	
Oct. 25	Stew Beef	187	114	73	106	44	62	134	58	76	146	41	105
	Cheese Stick	24	6	18	7	2	5	22	5	17	10	1	9
	Tomato Salad	63	31	32	53	21	32	32	17	15	45	18	27
	French Bread	36[¶]	29	7	26	10	16	32[¶]	18	14	32	11	21
	Chocolate Cake	50	7	43	29	1	28	60[†]	6	54	40[>]	4	36
	Milk	240	82	158	256	62	194	251	74	177	246	45	201

[ξ] Average wt. of food served obtained by weighing food items from 4 student trays and averaging the wt. for each food.

[Ψ] Average wt. of refuse per meal obtained by weighing plate waste of food items from student trays and averaging the wt. of each food.

[Ψ] Ice Cream sold on cafeteria serving line. Collectors observed students eating ice cream before lunch.

[Φ] Vanilla wafer.

[←] Commercial cookie.

[<] Peanut butter cookie.

[λ] Refuse taken from trays of 16 students who were involved in making pancakes during the morning.

[¶] Rolls. [†] Chocolate cake w/ chocolate icing. [>] Yellow cake w/ chocolate icing.

77/78

Table 16. Continued

Date	Food Item[ψ]	Saxapahaw (Exp)			South Mebane (Exp)			North Graham (Exp)			Haw River (Control)		
		Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal			grams per meal		
			N=80			*N=84*			*N=80*			*N=81*	
Oct. 28	Meat Loaf w/ Tomato Sauce	68	23	45	59	14	45	80	25	55	78	33	45
	Whipped Potatoes	137	69	68	68	30	38	94	51	43	85	32	53
	Green Beans	45	23	22	34	11	23	50	23	27	41	19	22
	Hot Rolls	35	10	25	28	8	20	54	14	40	43	13	30
	Gelatin Dessert w/ Whipped Topping	81	8	73	72	15	57	87	14	73	79	21	58
	Milk	243	107	136	246	82	164	244	92	152	237	80	157

79/80

Table 17. Summary of average weights of food as served[ξ] and refuse per meal[Ψ] for first, second, and third grade pupils in Alamance County Schools during April 1972.

Date	Food Item	Saxapahaw (Exp)			South Mebane (Exp)			North Graham (Exp)			Haw River (Control)		
		Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal			grams per meal		
			N=80			N=80			N=81			N=80	
April 17	Vienna Sausage	29	3	26	28	1	27	28	1	27	26	2	24
	Pork & Beans	75	22	53	65	16	49	65	16	49	65	12	53
	Cole Slaw	99	49	50	42	21	21	60	33	27	61	30	31
	Corn Bread	54	27	27	39	11	28	40	20	20	52		
	Apricots	57	17	40	61	24	37	37	13	24	57[Φ]	12[Φ]	45[Φ]
	Cookies	27[Ψ]	4	23	12	1	11	27[Ψ]	3	24			
	Milk	249	61	188	256	61	195	242	67	175	242	49	193
			N=80			N=80			N=80			N=80	
April 19	Stew beef	151	86	65	145[<]	73	72	104[←]	44	60	126	52	74
	Cheese Stick	21	3	18	19	5	14	23[←]	6	17	15	3	12
	Tomato Salad	23	8	15	47	23	24	30	11	19	57[¶]	29	28
	French Bread	55[λ]	13	42	31	10	21	32[†]	12	20	42[¶]	12	30
	Chocolate Cake	47	3	44	31	2	29	42[†]	4	38	38	2	36
	Milk	250	60	190	268	43	225	242	77	165	231	53	178

[ξ] Average wt. of food served obtained by weighing food items from 4 student trays and averaging the wt. for each food.

[Ψ] Average wt. of refuse per meal obtained by weighing plate waste of food items from student trays & averaging the wt. for each food.

[Ψ] School baked peanut butter cookie.

[Φ] Apricots & chocolate chip cookies were combined to obtain food as served wt. and refuse wt.

[←] School dismissed early. Children were very excited and rushed.

[<] Purchased American processed cheese served on tray for post sampling. USDA processed cheese served on tray in pre-sampling

[λ] Rolls served on trays in pre and post sampling.

[¶] Rolls served to last students of serving period were burned.

[†] Chocolate cake w/o icing.

81/82

Table 17. Continued

Date	Food Item	Saxapahaw (Exp)			South Mebane (Exp)			North Graham (Exp)			Haw River (Control)		
		Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten	Food Served	Refuse	Food Eaten
		grams per meal N=80			grams per meal N=86			grams per meal N=80			grams per meal N=80		
April 21	Meat Loaf w/ Tomato Sauce	70	20	50	72[>]	17	55	89	34	55	89	28	61
	Whipped Potatoes	120	56	64	91	47	44	84	39	45	102	24	78
	Green Beans	42	18	24	38	16	22	43	18	25	43	17	26
	Hot Rolls	50	13	37	40	5	35	47[§]	14[Ω]	33	33	12	21
	Gelatin Dessert w/ Whip Topping	91	10	81	79	41	38	96[§]	15[Ω]	81	69	8	61
	Milk	248	91	157	267	74	193	248	102	146	238	60	178

[>] First grade students purchased ice cream. Other students could purchase ice cream each day; first graders purchase ice cream one day each week. Meat loaf served w/o sauce.

[§] Whipped topping served to first grade students. Two trays were collected with topping and two trays without.

[Ω] Refuse wt. collected from 27 first grade students who had topping on gelatin dessert and 53 second and third grade students who did not have topping.

83/84

Table 18. Summary of average weights of food served[ξ] and refuse per meal[¥] for first, second and third year students in Goldsboro city schools during October 1971.

Date	Food Item	Edgecombe (Exp. grades 1,2)			East End (Exp. grade 3)			William St. (Control 1,2,3)		
		Food Weight	Refuse	Food Eaten	Food Weight	Refuse	Food Eaten	Food Weight	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal		
		N=80			*N=80*			*N=80*		
Oct. 15	Meat Loaf w/ Pickles	88	25[ψ]	63	80	20	60	58[ψ]	23	35
	String Beans	56	29	27	54	28	26	46	32	14
	Creamed Potatoes	88	26	62	107	49	58	91	37	54
	Peanut Butter Delight	34	3	31	67	4	63	23[¢]	6	17
	Milk	239	43	196	243	23	220	237	40	197
	Rolls	33	9	24	58[←]	40	18	31	8	23
		N=80			*N=82*			*N=81*		
Oct. 18	Stew Beef	155	46	109	177	52	125	93	36	57
	Turnip Greens	56	40	16	64	32	32	53	44	9
	Corn Bread	36	22	14	55	33[λ]	22	37	23	14
	Peach Halves	57	7	50	23[<]	25[λ]	-2	74[¶]	14	60
	Cookies	22[†]	3	19	23[>]	1	22	23[†]	2	21
	Milk	240	53	187	243	27	216	237	39	198

[ξ]Average wt. of food served obtained by weighing food items from 4 student trays and averaging the wt. for each food.

[¥]Average wt. of refuse per meal obtained by weighing plate waste of food items from student trays and averaging the wt. for each food.

[ψ]Meatloaf served without pickles.

[¢]Different kind of cookie substituted for Peanut Butter Delight.

[←]Corn Bread squares.

[<]Peach slices w/ prunes.

[λ]Indication of variation in portion of food served to students.

[¶]Pineapple slice w/ peach half.

[†]Sugar cookie.

[>]Commercial cookie with filling.

Table 18. Continued

Date	Food Item	Edgecombe (Exp. grades 1,2)			East End (Exp. grade 3)			William St. (Control 1,2,3)		
		Food Weight	Refuse	Food Eaten	Food Weight	Refuse	Food Eaten	Food Weight	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal		
			N=80			*N=84*			*N=80*	
Oct. 26	Pork Pattie w/ Rice & Gravy	130	39	91	190	73	117	153	59	94
	String Beans	51	30	21	48	26	22	41	26	15
	Wheat Rolls	43	9	34	36	4	32	35	5	30
	Apple Halves	83[§]	24	59	157	31	126	128[μ]	21	107
	Milk	239	80	159	245	40	205	243	52	191

87/88

[§]Apple half.

[μ]Whole apple.

Table 19. Summary of average weights of food as served[ξ] and refuse per meal[ψ] for first, second and third year pupils in Goldsboro City schools during April 1972.

Date	Food Item	Edgecombe (Exp. grades 1,2)			East End (Exp. grade 3)			William St. (Control 1,2,3)		
		Food Weight	Refuse	Food Eaten	Food Weight	Refuse	Food Eaten	Food Weight	Refuse	Food Eaten
		grams per meal			grams per meal			grams per meal		
			N=80			N=40			N=80	
April 14	Meat Loaf w/ Pickle	73	26	47	79	26	53	74[ψ]	13	61
	String Beans	58	36	22	54[φ]	43	11	58	24	34
	Creamed Potatoes	128	41	87	109[φ]	57	52	90	17	73
	Peanut Butter Delight	33	3	30	42	4	38	35	1	34
	Roll	48	18	30	47[←]	13	34	36	7	29
	Milk	247	43	204	242	34	208	245	24	221
			N=80			N=40			N=80	
April 18	Beef Stew	171	47	124	147	57	90	90	28	62
	Turnip Greens	56	44	12	68	26	42	34	22	12
	Corn Bread	51	30	21	53	31	22	38[λ]	22	16
	Peaches	73	6	67	88[<]			52	10	42
	Cookie (sugar)	19	2	17	32	0	32	27	5	22
	Milk	247	54	193	241	46	195	242	41	201

[ξ] Average wt. of food served obtained by weighing food items from 4 student trays and averaging the wt. for each food.

[ψ] Average wt. of refuse per meal obtained by weighing plate waste of food items from student trays and averaging the weight for each food.

[ψ] Pickle omitted from wt. of meat loaf.

[φ] Gravy served on potatoes.

[←] Cornbread substituted on menu in October.

[<] Prune not served w/ peaches.

[λ] Pineapple slice not served w/ peaches.

Table 19. Continued

Date	Food Item	Edgecombe (Exp. grades 1,2)				East End (Exp. grade 3)				William St. (Control 1,2,3)			
		Food Weight	Refuse	Food Eaten		Food Weight	Refuse	Food Eaten		Food Weight	Refuse	Food Eaten	
		grams per meal				grams per meal				grams per meal			
		N=80				*N=80*				*N=80*			
April 24	Pork Pattie w/	66	5	61	113	78	7	71	141	54	4	50	110
	Rice & Gravy	82	30	52		114	44	70		78	18	60	
	String Beans	49	28	21		43	19	24		56	29	27	
	Wheat Rolls	50	18	32		35	4	31		37	4†	33	
	Apple[η]	158	59	99		153	14	139		134	26†	108	
	Milk	246	72	174		241	29	212		247	34	213	

91/92

[η]Whole apples replaced apple halves.

†Apple half served to first grade students.

Table 19a. Total weights of food consumed per primary grade student, pre and post nutrition education.

Unit	Menu #	Grams Consumed			
		Experimental Groups[ξ]		Control Groups[ξ]	
		Pre	Post[<]	Pre	Post[<]
		Saxapahaw		Haw River	
Alamance	1	308	+99	452	-106
	2	331	+43	399	- 41
	3	369	+44	365	+ 60
		South Mebane			
	1	354	+14		
	2	337	+48		
	3	347	+40		
		North Graham			
	1	311	+35		
	2	353	-34		
	3	390	- 5		
		Edgecombe[Φ]		William Street	
Goldsboro	4	403	+17	340	+112
	5	395	+39	359	- 4
	6	364	+75	437	+ 54
		East End[Ψ]			
	4	445	-49		
	5	415	-34		
	6	502	+45		

[ξ] Grades 1, 2, and 3 in each group except where otherwise noted.

[<] Differences between pre (October, 1971) and post (April, 1972) weights of food consumed.

[Φ] Grades 1 and 2.

[Ψ] Grade 3.

schools. This showed that students who had nutrition education did better on the test than those who did not have nutrition. Almost consistently, experimental students had a higher percentage of correct answers than control students. See Table 20.

There were several questions for which the difference was large enough to mention. In question 11, students were asked to choose foods that would make a balanced lunch. The next two questions asked for amounts of milk and vegetables students should eat and drink each day. For all of these questions a higher percentage of correct responses was given by students in experimental groups when compared with controls. Another question asked students to identify foods made from milk; item 8 asked for the origin of bread. Although all students scored somewhat low on these items, a larger proportion of experimental than control students scored correctly. These results can be seen in Table 20 also.

For almost all questions, as grade of the student increased, percentage of students scoring correctly increased. This was evident in both experimental and control schools. Part of this pattern could be due to the fact that between the time a student is in the first grade and the third grade, his horizons have expanded considerably. The third grader is more mature and knows more about the world in which he lives. The fact that a greater number of experimental students than control students scored correctly on most test items even at third grade level shows that nutrition education, and not just maturity, was responsible for some of the increase.

Percentage of correct answers was examined by district and school as well as by grade. When this examination was done, no differences could be seen between the three experimental schools in Alamance County. Neither were there noticeable differences between schools in Goldsboro and Alamance, as shown in Table 21.

Table 20. Percentage of students responding correctly to items on post-test by treatment and grade.

Test item	Experimental schools			Control schools		
	1	2	3	1	2	3
1	96	97	96	92	96	96
2	64	65	73	47	63	65
3	84	90	90	81	92	94
4	43	63	63	31	45	64
5	80	89	89	76	86	91
6	31	32	34	28	33	30
7	88	91	96	77	88	92
8	56	67	76	30	47	64
9	95	95	98	93	94	98
10	40	52	62	16	40	53
11	61	72	80	37	60	62
12	57	61	75	37	54	62
13	30	23	40	15	29	34
14	55	60	67	32	52	69
15	55	59	69	37	44	67
16	50	60	67	14	24	40
17		85	90		77	86
18		70	66		62	68
19		78	89		73	83
20		9	18		4	2
21		16	14		17	15
22		26	27		16	20
23		33	51		29	39
24		9	3		0	5
25		44	55		38	44
26		49	41		55	44
27		47	59		37	42
28		12	12		11	16
29		11	19		11	12
30		17	11		6	11

Table 21. Percentage of students responding correctly to items on posttest by district, school, and grade.

Test item	Goldsboro						Alamance											
	Edgewood[ξ]		East End[ξ]	William St.[ψ]			S. Mebane[ξ]			N. Graham[ξ]			Saxapahaw[ξ]			Haw River[ψ]		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1	96	95	94	92	95	96	95	97	97	100	99	100	93	98	96	91	97	96
2	61	63	70	50	58	64	54	72	65	76	70	87	73	61	78	41	70	67
3	77	90	80	81	90	94	89	93	94	93	92	99	88	88	96	81	95	95
4	63	65	65	34	50	65	24	67	62	38	63	69	53	54	52	27	38	61
5	81	89	90	89	87	91	71	93	90	88	90	89	75	82	78	55	84	90
6	35	41	45	32	45	32	30	15	31	29	35	23	24	18	20	22	18	23
7	87	89	95	75	90	90	93	94	94	88	95	98	85	91	96	79	86	98
8	52	60	73	34	35	61	57	66	79	67	85	78	54	65	74	23	63	70
9	93	93	99	90	93	97	98	100	98	98	94	100	97	96	92	99	96	100
10	49	55	62	14	34	50	33	40	54	29	64	82	37	42	52	18	50	63
11	67	68	70	40	50	59	73	84	86	46	86	95	47	54	74	33	72	70
12	58	53	68	32	48	61	69	76	75	54	72	89	42	51	78	45	64	65
13	32	21	57	19	31	34	24	27	23	34	21	42	29	30	20	10	26	35
14	63	63	74	36	58	70	51	57	61	40	55	72	56	58	50	24	43	64
15	61	57	70	30	46	69	49	64	63	56	59	82	44	61	56	50	41	63
16	59	54	65	16	15	36	40	67	63	56	65	82	25	61	56	12	36	52
17		84	90		76	86		81	86		89	94		84	94		79	86
18		68	65		54	63		73	66		75	75		63	56		73	82
19		76	87		72	81		73	88		86	94		81	90		75	87
20		10	26		6	2		12	12		1	19		11	0		0	0
21		15	7		14	15		22	12		13	25		14	22		21	14
22		28	21		15	19		25	40		26	28		23	18		17	25
23		32	54		33	39		27	44		34	67		40	30		22	37
24		1	3		0	5		46	2		0	7		5	2		0	6
25		41	44		35	43		51	60		40	73		51	48		43	46
26		47	27		52	46		46	52		39	54		74	44		60	37
27		40	58		38	43		51	63		46	55		33	62		36	38
28		14	10		9	15		10	17		7	11		18	10		14	18
29		7	22		16	11		12	18		5	22		16	8		11	15
30		15	15		6	13		28	12		15	5		12	4		5	5

[ξ] Experimental school

[ψ] Control school

Results of the test were used for evaluating concepts in the curriculum guide, as shown in Tables 22 and 23. The extremely low percentage of all students scoring correctly on some items indicated that primary grades might not be the appropriate level for introduction of certain concepts. Functions of vitamins and minerals in the body and sources of these nutrients seemed to be concepts difficult for students to grasp.

Questions requiring ability to recognize where foods come from were, in general, low scoring items. The fact that nutrition education students more often answered correctly these items than did control group students showed that, although grasped slowly, these concepts could be understood.

An analysis of variance was also performed on test data. This can be found in Appendix C. The same kinds of results were obtained for grades one, two, and three. There were obvious differences among classes within a school. These differences probably reflect influence of the teachers. Differences among experimental schools were small. Differences, however, between experimental and control schools showed that nutrition education had a large effect.

Little interaction was seen between questions and schools or questions and classes. There was considerable variation among questions. Variations seen among questions could be explained in the following way. As described previously, test items were constructed according the concepts in the curriculum guide. Some teachers did not teach all concepts in the guide. In a particular class, most of the students, therefore, could have scored incorrectly on an item if the specific concept was not taught.

When results of the posttest are examined, it can be concluded that nutrition education did have an effect on the students' knowledge of nutrition. The test was as good an instrument as could be obtained for the present study. It is recommended, however, that further work with reliability and validity of the test be carried out before further use.

Table 22. Percent correct responses on items and concepts by treatment and grade.

Item	Concept	Precent correct responses by treatment and grade					
		Experimental			Control		
		1	2	3	1	2	3
1	Food is what we eat (I)[Ψ]	96	97	96	92	96	96
2	All living things need food (I)	64	65	73	47	63	65
3	There are many different kinds of food (I)	84	90	90	81	92	94
4	Same	43	63	63	31	45	64
5	Same	80	89	89	76	86	91
6	Some of our food comes from animals (II)	31	32	34	28	33	30
7	Milk comes from cows (III)	88	91	96	77	88	92
8	Breads and cereals come from grain which grows on the farm. Cereal grain is a plant (III)	56	67	76	30	47	64
9	Food gives us energy for doing things--work and play. Food is the fuel for our bodies. Food is used to produce energy to help us move (IV)	95	95	98	93	94	98
10	To grow as we should we need to have enough food and the right kinds of food. (IV)	40	52	62	16	40	53
11	Same	61	72	80	37	60	62
12	Same	57	61	75	37	54	62
13	Meat comes from many animals (III)	30	23	40	15	29	34
14	Same	55	60	67	32	52	69
15	There are many good foods to eat for snacks (V)	55	59	69	37	44	67
16	Milk comes from cows (III)	50	60	67	14	24	40

[Ψ]Roman numerals after statements refer to concepts given in the curriculum guide.

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Table 22. Continued

Item	Concept	Percent correct responses by treatment and grade					
		Experimental			Control		
		1	2	3	1	2	3
17	Fruits and vegetables come from plants that grow on the farm or in the garden (III)		85	90		77	86
18	Same		70	66		62	68
19	Same		78	89		73	83
20	Some foods are especially good for building muscles (IV)		9	18		4	2
21	Some of our food comes from plants (II)		16	14		17	15
22	Same		26	27		16	20
23	To grow as we should, we need to have enough food and the right kinds of food (IV)		33	51		29	39
24	Many foods are transported from other places by truck, train, airplane, or ship. (III)		9	3		0	5
25	Some foods are especially good for building bones and teeth.		44	55		38	44
26	Some foods are especially good for building muscles. (IV)		49	41		55	44
27	Same		47	59		37	42
28	Food makes a difference in how we look and feel (IV)		12	12		11	16
29	Same		11	19		11	12
30	Food is good. Eating food is fun. Food gives us pleasure because we like the way it tastes, smells, feels, and looks. Learning to eat new foods is fun. (IV)		17	11		6	11

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Table 23. Percent correct responses on items and concepts by district, school, and grade.

Item	Concept	Percent correct responses by District, School, and Grade																		
		Goldsboro						Alamance												
		Edgewood		East End	William St.			S. Mebane			N. Graham			Saxapahaw			Haw River		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1	Food is what we eat (I)	96	95	94	92	95	96	95	97	97	100	99	100	3	98	96	91	97	96
2	All living things need food (I)	61	63	70	50	58	64	54	72	65	76	70	87	73	61	78	41	70	67
3	There are many different kinds of food (I)	77	90	80	81	90	94	89	93	94	93	92	99	88	88	96	81	95	95
4	Same	63	65	65	34	50	65	24	67	62	38	63	89	53	54	52	27	38	61
5	Same	81	89	90	89	87	91	71	93	90	88	90	89	75	82	78	55	84	90
6	Some of our food comes from animals (II)	35	41	45	32	45	32	30	15	31	29	35	23	24	18	20	22	18	23
7	Milk comes from cows (III)	87	89	95	75	90	90	93	94	94	88	95	98	85	91	96	79	86	98
8	Breads and cereals come from grain which grows on the farm. Cereal grain is a plant (III)	52	60	73	34	35	61	57	66	79	67	85	78	54	65	74	23	63	70
9	Food gives us energy for doing things--work and play. Food is the fuel for our bodies. Food is used to produce energy to help us move. (IV)	93	93	99	90	93	97	98	100	98	98	94	100	97	96	92	99	96	100
10	To grow as we should we need to have enough food and the right kinds of food. (IV)	49	55	62	14	34	50	33	40	54	29	64	82	37	42	52	18	50	63
11	Same	67	68	70	40	50	59	73	84	86	46	86	95	47	54	74	33	72	70
12	Same	58	53	68	32	48	61	69	76	75	54	72	89	42	51	78	45	64	65
13	Meat comes from many animals (III)	32	21	57	19	31	34	24	27	23	34	21	42	29	30	20	10	26	35

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Table 25 Continued

Item	Concept	Percent correct responses by District, School, and Grade																			
		Goldsboro						Alamance													
		Edgewood			East End			William St.			S. Mebane			N. Graham			Saxapahaw			Haw River		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
14	Same	63	63	74	36	58	70	51	57	61	40	55	72	56	58	50	24	43	64			
15	There are many good foods to eat for snacks (V)	61	57	70	30	46	69	49	64	63	56	59	82	44	61	56	50	41	63			
16	Milk comes from cows (III)	59	54	65	16	15	36	40	67	63	56	65	82	25	61	56	12	36	52			
17	Fruits and vegetables come from plants that grow on the farm or in the garden (III)		84	90		76	86		81	86		89	94		84	94		79	86			
18	Same		68	65		54	63		73	66		75	75		63	56		73	82			
19	Same		76	87		72	81		73	88		86	94		81	90		75	87			
20	Some foods are especially good for building muscles (IV)		10	26		6	2		12	12		1	19		11	0		0	0			
21	Some of our food comes from plants (II)		15	7		14	15		22	12		13	25		14	22		21	14			
22	Same		28	21		15	19		25	40		26	28		23	18		17	25			
23	To grow as we should, we need to have enough food and the right kinds of food (IV)		32	54		33	39		27	44		34	67		40	30		22	37			
24	Many foods are transported from other places by truck, train, airplane, or ship. (III)		1	3		0	5		46	2		0	7		5	2		0	6			
25	Some foods are especially good for building bones and teeth. (IV)		41	44		35	43		51	60		40	73		51	48		43	46			
26	Some foods are especially good for building muscles. (IV)		47	27		52	46		46	52		39	54		74	44		60	37			

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Table Continued

Item	Concept	Percent correct responses by District, School, and Grade															
		Goldsboro						Alamance									
		Edgewood		East End	William St.			S. Mebane			N. Graham			Saxapahaw			Haw River		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
27	Same		40	58		38	43			51	63		46	55		33	62		36	38
28	Food makes a difference in how we look and feel (IV)		14	10		9	15			10	17		7	11		18	10		14	18
29	Same		7	22		16	11			12	18		5	22		16	8		11	15
30	Food is good. Eating food is fun. Food gives us pleasure because we like the way it tastes, smells, feels, and looks. Learning to eat new foods is fun. (IV)		15	15		6	13			28	12		15	5		12	4		5	5

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NASHVILLE PHASE

Methodology

A separate phase of the project was carried out in the Nashville Elementary School. Two fifth grade teachers who had participated in the project during program year I, acted as school coordinators by setting up nutrition education workshops and helping the other teachers. The school lunch director also was active in the program.

The nutrition education coordinator visited the school every third Monday. During the day, the coordinator visited classrooms and spoke with individual teachers. A forty-five minute in-service meeting was held after school. At the first and last meetings, the coordinator spoke to the entire group of teachers. During the year, teachers were divided into two groups: first through third grade teachers and fourth through sixth grade teachers. The coordinator spoke alternately to these groups.

First through third grade teachers used the same curriculum guide as Goldsboro and Alamance County. Fourth through sixth grade teachers did not have a guide. Lack of a guide was considered a handicap. Teachers also had a difficult time locating resource materials.

RESULTS AND DISCUSSION

Students in grades one to three were given the posttest described previously. The teachers, however, saw a rough draft of the test several months before testing. From the extremely high percentage of students answering all items correctly, it is believed that teachers taught toward the test. It is difficult, therefore, to draw any conclusions from the results. See Table 24.

Table 24. Percentage of students responding correctly to items on posttest in grades one, two, and three in Nashville Elementary School.

Test item	Grade		
	1	2	3
1	95	94	100
2	77	87	99
3	73	93	98
4	53	69	73
5	85	94	93
6	47	59	58
7	88	98	99
8	70	92	97
9	96	98	99
10	72	93	79
11	78	92	98
12	59	82	89
13	54	59	51
14	74	80	88
15	68	79	80
16	78	88	89
17		89	99
18		68	91
19		93	98
20		52	63
21		36	34
22		43	43
23		74	64
24		35	57
25		72	60
26		79	62
27		67	58
28		16	27
29		34	26
30		59	48

Students in grades four to six were given as a pretest and posttest the same test used in the project last year. Percentage of students answering each item correctly is shown in Tables 25 and 26. The greatest improvement from pretest to posttest was seen for grade four. As grade level increased, the difference between percentage of students scoring correctly on pre and post test decreased. This was due to the fact that in each successive grade more students scored correctly on each item on the pretest, thereby, decreasing the difference between the two tests. Notice the high percentage of students who answered many items correctly on the sixth grade pretest.

Some teachers kept classroom records of student eating preferences during the year. In one primary class only five of 27 students had ever seen asparagus. After the tasting party, 23 said they liked it. A fifth grade class also cooked asparagus when the teacher discovered that 25 of the 28 students had never seen or tasted the vegetable. Fifteen liked it and 13 said they could learn to like it. In Table 27 are given results of a tasting party in one primary grade classroom.

All teachers said they believed that students' eating habits had improved after nutrition education. They felt some of the improvement was due to an activity as simple as explaining what some foods were. For example, the primary grades had a tasting party with prunes (an item usually thrown away at lunch). Teachers reported that after the tasting party, all students ate some of the prunes they were served in the lunchrrom, and most ate all.

Whether food habits actually changed as a result of nutrition education was assessed by comparing plate waste from identical menus served in October, before the onset of nutrition education, and in April. No improvement due to nutrition education was seen in these data.

Table 25. Percentage of fourth and fifth grade students responding correctly to items on pretest and posttest in Nashville Elementary School.

Test item	Fourth grade			Fifth grade		
	Pre-test	Post-test	Difference	Pre-test	Post-test	Difference
1	85	85	0	87	93	6
2	65	71	6	72	89	17
3	83	79	-	67	65	-
4	52	65	13	44	54	10
5	16	34	18	45	52	7
6	76	90	14	82	91	9
7	26	65	39	84	92	8
8	45	83	38	97	97	0
9	56	78	22	96	97	1
10	57	81	24	72	86	14
11	49	79	30	67	80	13
12	24	22	-	36	42	6
13	68	86	18	87	92	5
14	82	90	8	84	90	6
15	75	79	4	59	82	23
16	77	91	14	79	90	11
17	65	69	4	72	76	4
18	60	63	3	54	74	20
19	18	36	18	18	18	0
20	87	90	3	88	92	4
21	85	88	3	90	75	-
22	73	77	4	77	90	13
23	85	93	8	92	96	4
24	59	84	25	73	83	10
25	78	85	7	87	92	5
26	93	92	-	96	97	1
27	90	95	5	96	96	0
28	92	96	4	90	97	7
29	81	88	7	73	86	13
30	74	85	11	75	86	11
31	63	66	3	76	89	13
32	55	64	9	73	79	6

Table 26. Percentage of sixth grade students responding correctly to items on pretest and posttest in Nashville Elementary School.

Test item	Pretest	Posttest	Difference
1	92	88	-
2	70	70	0
3	72	79	7
4	84	88	4
5	54	66	12
6	58	61	3
7	62	63	1
8	96	99	3
9	96	97	1
10	98	99	1
11	99	99	0
12	92	98	6
13	100	100	0
14	97	100	3
15	96	97	1
16	98	98	0
17	92	99	7
18	54	71	17
19	88	81	-
20	83	76	-
21	81	86	5
22	63	66	3
23	73	78	5
24	37	55	18
25	29	37	8
26	45	36	-
27	65	70	5
28	86	92	6
29	82	86	4
30	67	77	10
31	77	77	0
32	94	97	3
33	90	90	0
34	58	67	9
35	82	93	11
36	86	81	-
37	65	72	7
38	79	82	5
39	65	80	15
40	86	88	2
41	95	97	2
42	92	92	0
43	65	73	8
44	88	87	-
45	92	92	0
46	88	89	1

Table 27. Number of first grade students who tried and liked seven vegetables at a classroom tasting party.

Vegetable	No. who tried vegetable	No. who liked vegetable
Lettuce	25	24
Radish	23	20
Cucumber	25	23
Celery	23	21
Green pepper	20	15
Carrots	25	25
Cabbage	24	23

RECOMMENDATIONS FROM THE NUTRITION EDUCATION COORDINATOR

Several recommendations can be made as a result of the second year nutrition education project. First, behavioral objectives should be included in the curriculum guide. Although the guide already contains several general objectives, they are not believed specific enough for use in evaluating student learning.

Several concepts in the guide should be excluded for the primary grade level. These are the concepts that deal with functions and sources of nutrients. Some activities, such as the animal feeding demonstration, are too advanced for the first through third graders.

Concepts and learning activities eliminated from the "K - 3" guide could be included in a guide for grades four to six. Intermediate grade teachers involved in the Year II project expressed a need for such a guide.

Some teachers who used the "K - 3" curriculum guide recommended that it be made more specific by presenting in sequence suggested activities for grades one, two, and three. This would require a guide for each separate grade. While separate guides would be fine for a school with graded, self-contained classrooms, it might be a hindrance to teachers in an open classroom or non-graded school. A guide should be flexible in order that teachers in a variety of situations can use it. Structure of the existing curriculum guide seems to meet this criterion.

Although a guide can be provided to the teachers, at some point they must assume responsibility for carrying out the program. They must adapt the guide to their specific needs. If the teachers feel they are repeating information in several grades, it is their respon-

sibility to plan the sequence of learning activities according to concepts in the guide but geared to their particular situation.

During the project, teachers were not evaluated by any objective methods. From general observation and conversation, the coordinator became familiar with the teachers and, in general, was pleased with their response. For this project, teachers were required to participate. Had teachers volunteered they might have been more enthusiastic. For purposes of the present study, however, there was an advantage in having all first through third grade teachers in the school involved. Also, there were teachers who, negative at the beginning of the project, changed their opinions by the end of the year. Surprised at the interest of the students they became more motivated and interested themselves.

Teachers need a local resource person knowledgeable in nutrition. This person should be thoroughly trained in nutrition; he might be a nutrition education supervisor employed in the local school system, a county extension home economics agent, a local public health nutritionist, a school lunch supervisor or anyone else with appropriate qualification.

To carry out an effective nutrition education program in North Carolina, the following suggestions were submitted. A comprehensive plan should be made at the state level under the Department of Education. It is recommended that this be done by a Department of Nutrition Education staffed by professionals with a background in nutrition and education. For maximum accomplishment this staff should interrelate and work cooperatively with other departments in SDE such as School Lunch, Health Education and Early Childhood Education on the elementary level, and Home Economics and Science at the secondary level.

Since the approach to nutrition education at elementary and secondary levels is quite different, it is suggested that the two programs be kept separate, at least at first. It is felt that priority should be given to development of the elementary program. Evidence from program Year I indicated that younger students were the more willing to alter eating habits. In the Year II project, the coordinator found students enthusiastic and eager to learn.

During this study, some teachers invited parents to participate in classroom activities. In future nutrition education programs greater effort should be made to include parents in nutrition. This might be accomplished by cooperation with community health professionals. Although focused on schools, a nutrition education program should include the total community.

APPENDIX A

Cognitive Nutrition Test for Teachers

Cognitive Nutrition Tests for Each Grade Level

COGNITIVE NUTRITION TEST FOR TEACHERS

I. Find the word in the right column which fits each of the descriptions or definitions in the left column. Write the number of the word on the answer sheet in the space by the letter of the description it fits. A word from the list may be used more than once.

a. The science of dealing with the food eaten and how the body uses it.

b. Lack of proper food.

c. Mineral necessary for the formation of bones and teeth.

d. Element essential for proper functioning of the thyroid gland.

e. Red coloring matter in the blood.

f. A disease which may be caused by a shortage of red corpuscles.

g. A part of protein.

h. Fuel food for the body.

i. A unit of measure of heat energy in food.

j. A form of carbohydrate stored in the liver until needed by the body.

k. Undigested material which forms bulk in the diet and is useful for normal elimination.

l. Any substance which furnishes energy, builds and repairs the body, or regulates the body processes.

m. Builds, maintains and repairs body tissue.

n. Chemical regulators found in foods which stimulate growth and other body activities and prevents deficiency diseases.

o. General term that includes sweet, starchy and cellulose foods.

p. A disease which may be caused from a lack of vitamin C in the diet.

1. Anemia
2. Amino Acid
3. Calcium
4. Calorie
5. Carbohydrates
6. Glycogen
7. Hemoglobin
8. Scurvy
9. Iodine
10. Nutrient
11. Malnutrition
12. Cellulose
13. Vitamins
14. Nutrition
15. Protein

II. Use the answer sheet to complete the following statements by placing an X in front of each ending which makes the statement true. (Statements have more than one ending)

1. The main classes of food nutrients which regulate and protect body functions are:

   a. Fats
   b. Carbohydrates
   c. Minerals
   d. Vitamins
   e. Protein

2. The main classes of nutrients which supply energy (calories) to the body are:

   a. Proteins
   b. Sucrose
   c. Cellulose
   d. Fats
   e. Carbohydrates

3. Symptoms of under nutrition:

   a. Loss of wieght
   b. Swallow complexion
   c. Overwieght
   d. Frequent colds
   e. Decaying teeth
   f. Healthy, glossy hair
   g. Poor vision

4. The principal funciton of Vitamin A are the prevention of:

   a. Nightblindness
   b. Infections
   c. Scurvy
   d. Pellagra

5. The food groups which form a foundation for a well balanced diet are:

   a. Milk and milk products.
   b. Carbohydrates: starch, sugar, cellulose.
   c. Lean meats of all kinds, eggs, poultry, and fish. As alternates--dry beans, dry peas, lentils, nuts, peanuts, and peanut butter.
   d. Fruits and vegetables--especially those rich in Vitamin A and C.
   e. Citrus fruits: oranges, lemons, grapefruit, tangerines, etc.
   f. Fats: butter, margarine, cream, olive oil and other oils and fats.
   g. Whole grain, enriched, and restored breads and cereals.

6. Good sources of iron are:

   a. Milk
   b. Cheese
   c. Liver
   d. Muscle meat
   e. Egg yolk
   f. Celery
   g. Cucumbers

III. In the space allowed on the answer sheet, write F it the statement is false and T if it is true. Write the word or words which makes each false statement false.

1. Needs for nutrients are greatest during periods of rapid growth.

2. According to the U.S.D.A. surveys of 1965-66 and 1968, clacium and iron were the nutrients most often below the recommended allowances.

3. An overview of the 1965-66 survey by the U.S.D.A. in the households of the U.S.A. showed some trends in eating habits:

   a. Snacks were decreasing in popularity.
   b. Differences in regional food patterns are becoming more distinct.
   c. Foods that require less preparation in the home are gaining favor.
   d. Families at all income levels are eating less meat, poultry, & fish.
   e. Household consumption of milk and milk products and fruits had vegetables declined between 1955 and 1965.

4. The Type A lunch consists of specified amounts of the following: a protein-rich food; two or more fruits or vegetables or both; whole-grain or enriched bread; butter or fortified margarine; and fluid whole milk, served as a beverage.

5. To assure that all Type A lunches meet the nutritional goal, it is recommended that lunches include:

   a. A vitamin C food once a week.
   b. A vitamin A food twice a week.
   c. Several foods for IRON each day and larger portions of some of these when possible.

6. With the exception of butter and cream, milk and milk products are the most concentrated sources of calcium.

IV. Evaluate the following menus on the answer sheet by placing an X in the space beside the menu which provides the greatest variety of food nutrients and by giving the reasons for your choice.

Menu A

Fruit Cup
Spaghetti with Meat Sauce
Pickles and Olives
Hot Rolls, Butter
Pecan Pie
Milk Coffee

Menu B

Tomato Juice Cocktail
Country Style Steak - Hot Baked Sweet Potatoes
Congealed Orange - Cranberry Salad
Whole Wheat Muffins Butter
Cup Custard
Milk Coffee

V. List points by which nutrition educaiton materials should be evaluated.

VI. List reasons why some people do not eat balanced diets.

VII. List four community resources which you could use in your classes to teach foods and/or nutrition.

NUTRITION EDUCATION PRE-POST TEST

5th Grade

The following questions and choices were shown on transparencies, and read twice to each group. Students marked their choices on an answer sheet (attached).

1. Nutrition is the study of: (1)

   *A. Food and how our body uses it
   B. How food is grown
   C. How many vitanim pills we need each day

2. Select the group of people who need about the same amount and kinds of food from each of the food groups that you need each day. (1)

   A. A mother and baby
   B. Adult men
   *C. Boys and girls in elementary school

3. Which of the following groups of vegetables and fruits would provide the amount recommended for you each day? (1)

   A. Two servings
   B. One serving
   C. Three servings
   *D. Four servings

4. Which of the following groups of breads and cereals would provide the amount recommended for you each day? (1)

   A. 1 bread and cookies
   B. 2 breads and 1 cereal
   C. 2 bread and 1 macaroni
   *D. 3 breads and 1 cereal

5. Which of the following groups of milk products would provide the amount recommended for you each day? (1)

   A. One serving
   *B. Three servings
   C. Six servings
   D. Two servings

6. Which is the best way to store cooked vegetables and meats? (1)

   A. Uncovered on a counter or table
   *B. Covered in a refrigerator
   C. Uncovered in an oven

7. In which three of the labeled parts of the body is food digested? (3)

   *A. Mouth
   B. Heart
   *C. Stomach
   *D. Intestines

8. Calcium is necessary for the development and health of which of these parts of our body? Select two. (2)

   *A. Bones
   *B. Teeth
   C. Hair
   D. Ears
   E. Eye

9. Which of these foods contain lots of iron to help our body to build healthy blood? Select three. (3)

*A. Raisins	*C. Broccoli	*E. Liver
B. Corn	D. Candy bar	

10. Vitamin C helps our body to have healthy gums and body tissues. Which two of these foods contain Vitamin C? (2)

A. Biscuits	*C. Orange
*B. Lemon	D. Green snap beans

11. Which three of these foods contain lots of carbohydrates? (3)

*A. Macaroni	*D. Candy bar
*B. Baked yellow squash	E. Green snap beans
C. T-Bone Steak	

12. Which three of these foods are the best to help the body build and repair body tissues? (3)

*A. Tomatoes	*C. Chicken	E. Crackers
B. Jelly	*D. Sweet potato	

13. Select three of these foods for an after-school snack that will give you lots of vitamins. (3)

*A. Apple	C. Soft drink	E. Candy bar
*B. Peanut Butter Sandwich	D. Potato chips	*F. Milk

14. Which of these foods are made from milk? Select two. (2)

*A. Ice cream	C. Ketchup	*E. Cheese
B. Fried egg	D. Hamburger	

15. Which of these foods are found in the vegetable and fruit group in the "Daily Food Guide"? Select three. (3)

*A. Broccoli	C. Macaroni	*E. Strawberries
*B Sweet potato	D. Hot dog	

16. If you have gained a lot of weight or if you weigh a lot more than the average for age, which of these foods would be best for you to eat as an after-school snack? Select two. (2)

A. Cookies	D. Candy bar	
*B. Tomato juice	*E. Carrots	
C. Mixed nuts	F. Soft drink	

1. Nutrition is the study of:

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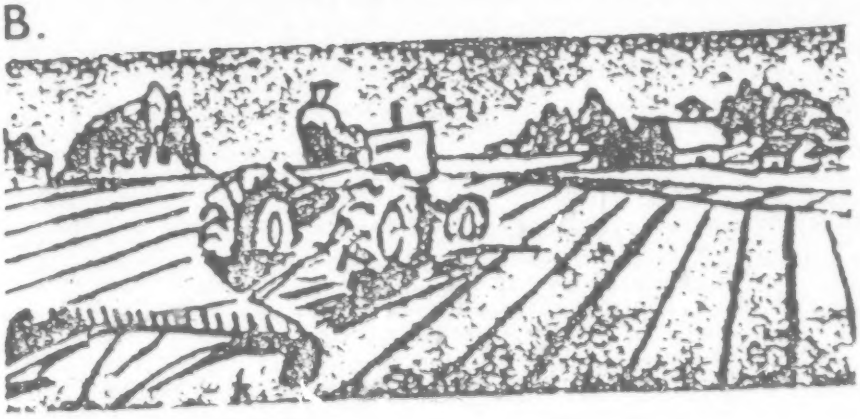
A.

B.



C.

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2. Select the group of people who need about the same same amount and kinds of food from each of the food groups that you need each day.

A.

B.

C.

NOTES

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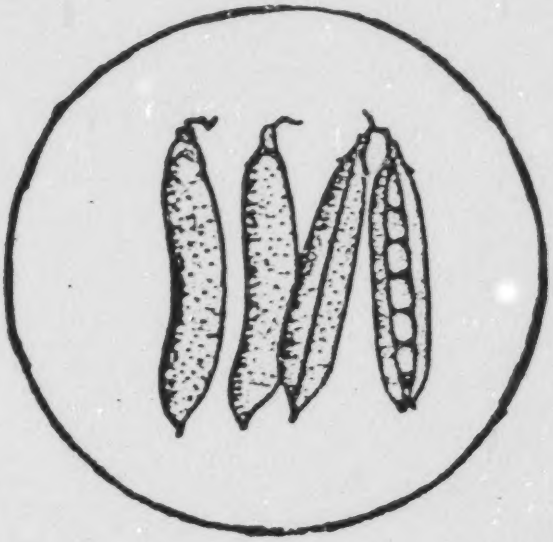
Which of the following groups of vegetables and fruits would provide the amount recommended for you each day?

A.

B.



C.

D.

NOTES

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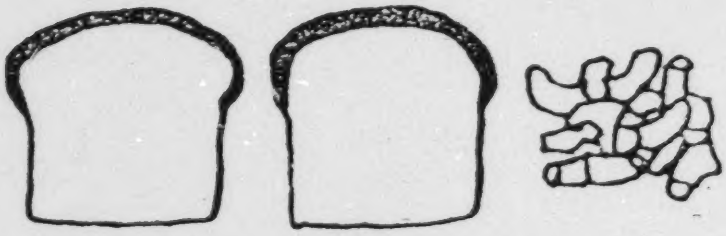
4. Which of the following groups of breads and cereals would provide the amount recommended for you each day?

A.

B.

C. 

D.

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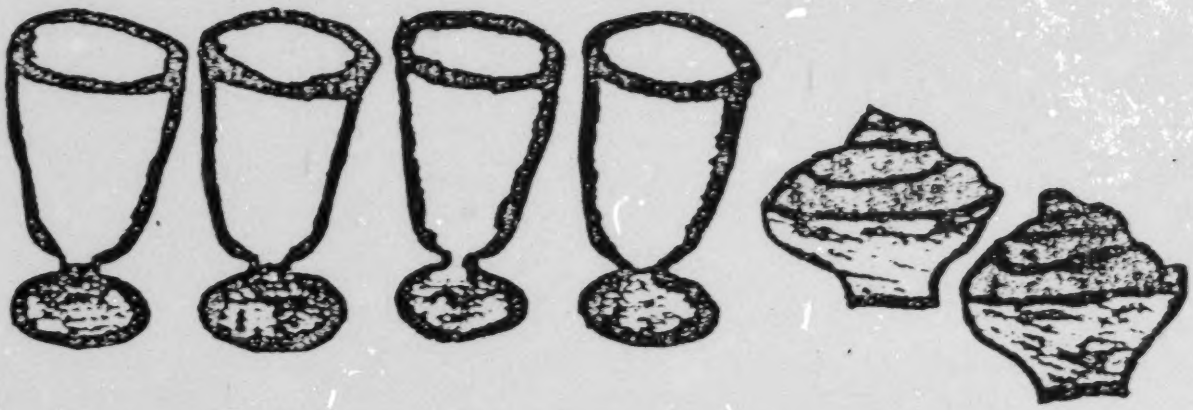
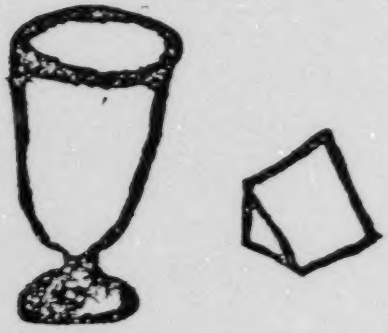
5. Which of the following groups of milk products would provide the amount recommended for you each day?

A.

B.

C. 

D. 

NOTES

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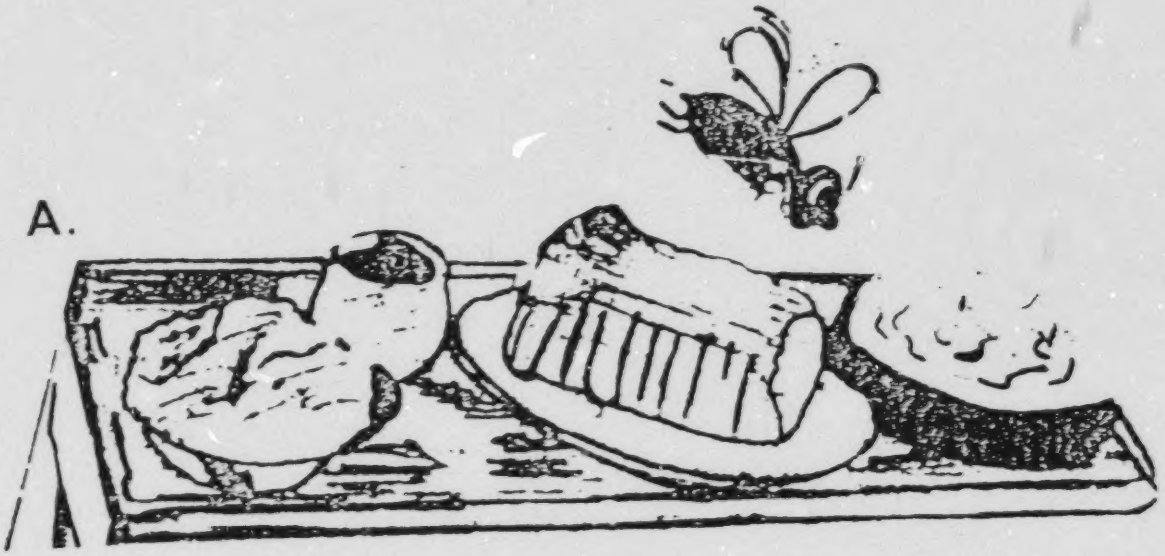
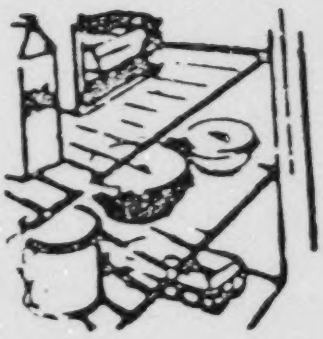
6. Which is the best way to store cooked vegetables and meats?

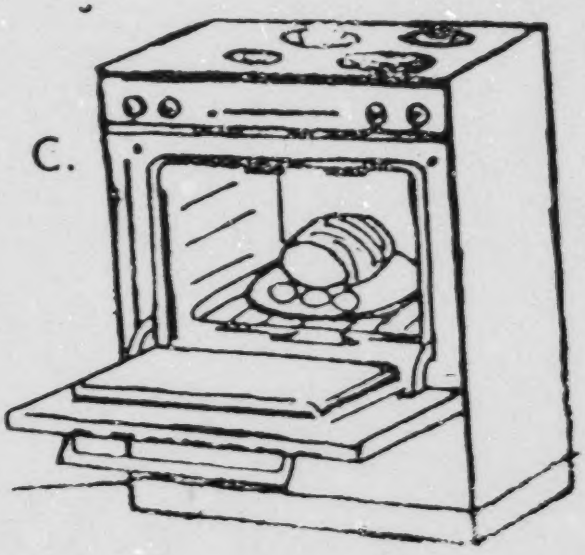
A.



B.



C.



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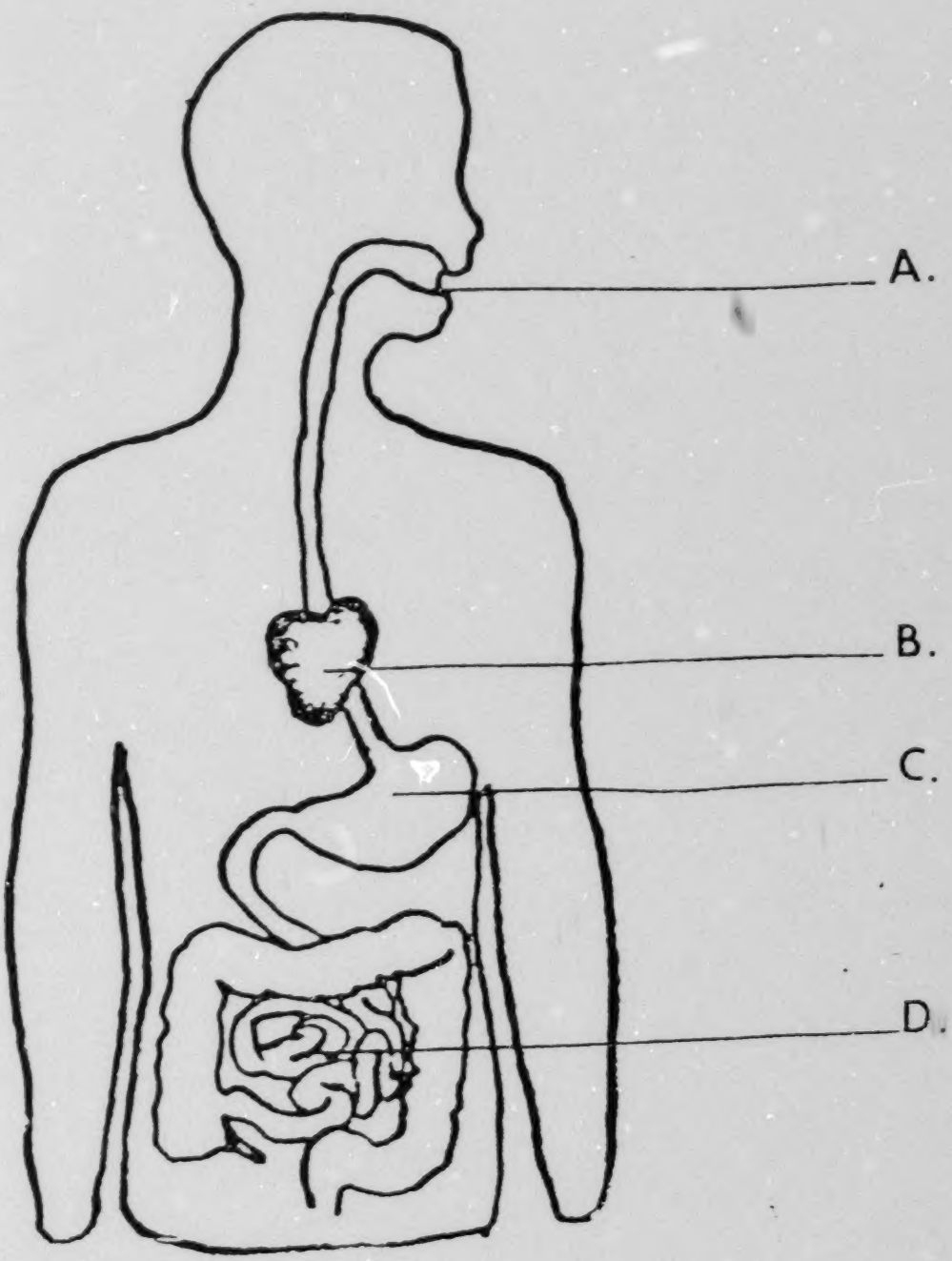
7. In which three of the labeled parts of the body is food digested?



NOTES

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Calcium is necessary for the development and health of which of these parts of our body? Select two.

A.

Skeleton

B.

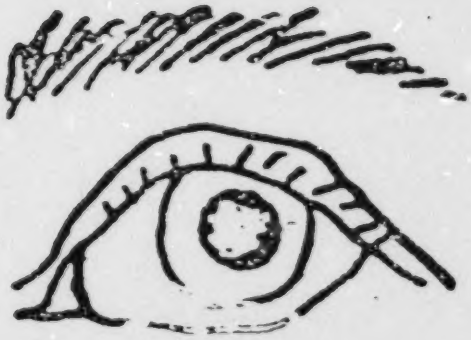
Teeth

C.

Hair

D.

Ears



E. Eye

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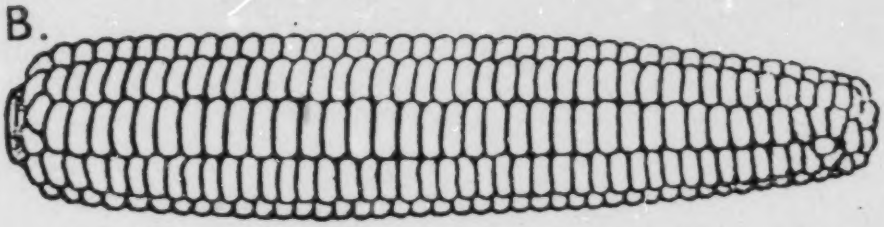
9. Which of these foods contain lots of iron to help our body to build healthy blood?

Select three.

A.

B.



Corn

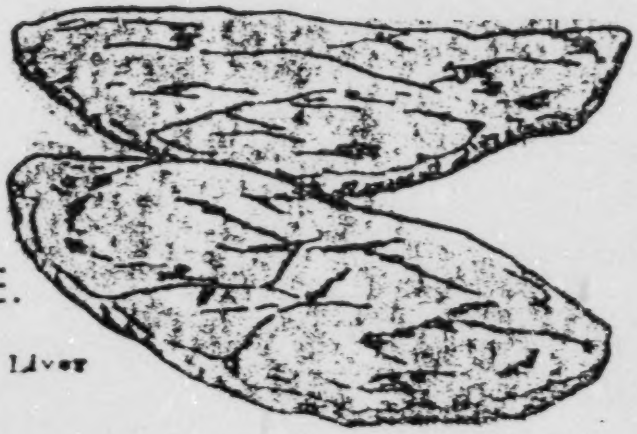
C.

Broccoli

D.

Candy Bar

E.



Liver

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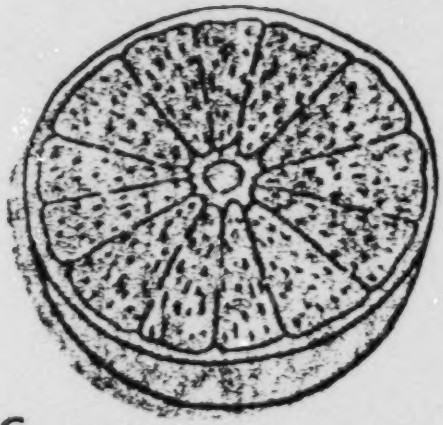
10. Vitamin C helps our body to have healthy gums and body tissues. Which two of these foods contain Vitamin C?

A.

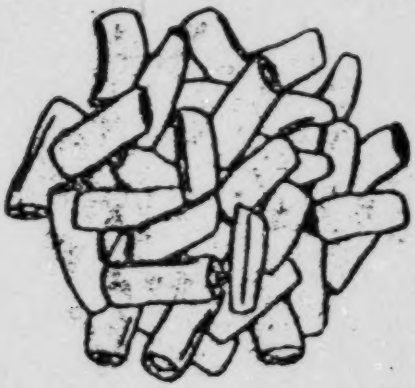
riched
cuits

B.

Lemon



C. Orange



D. Green Snap Beans

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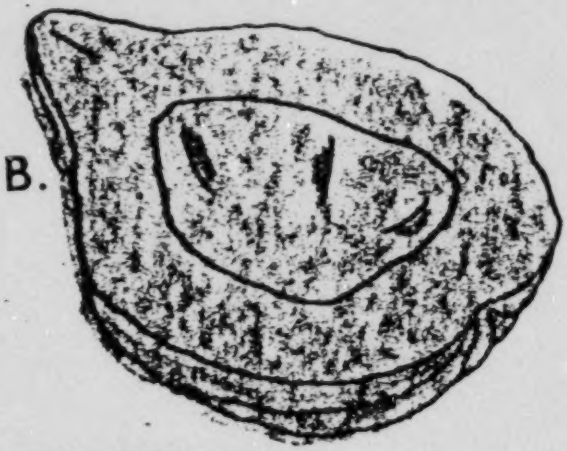
11. Which three of these foods contain lots of carbohydrates?

A.

Macaroni with Cheese

B.

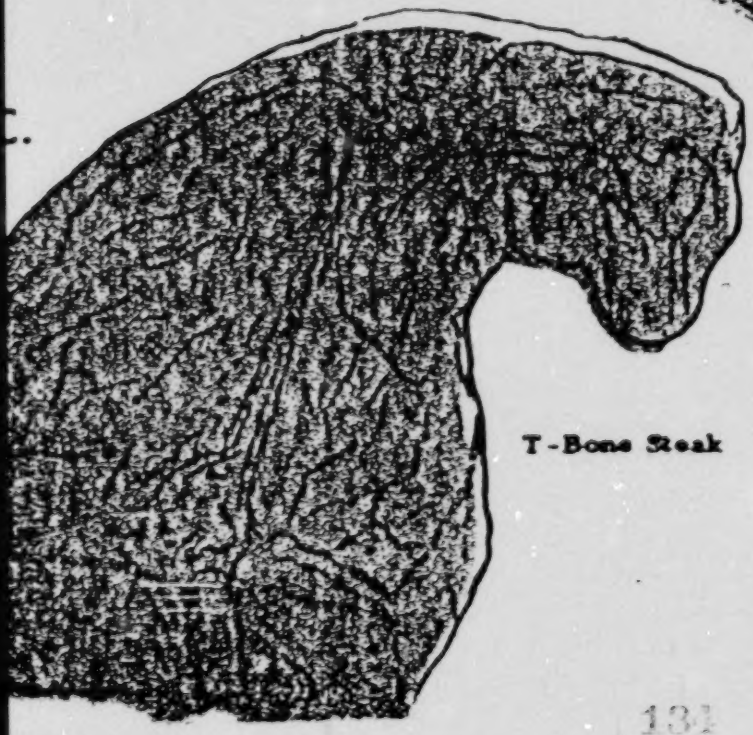


Baked Yellow Squash

D.

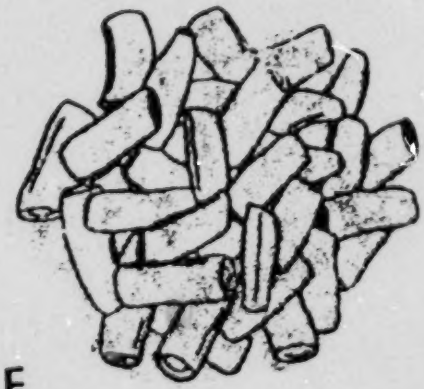
Candy Bar

C.



T-Bone Steak

E.



Green [illegible] Beans

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12. Which three of these foods are the best to help the body build and repair body tissues?

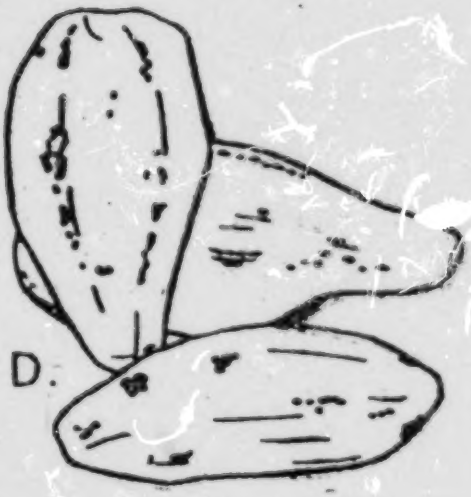
A.

Tomatoes

B.

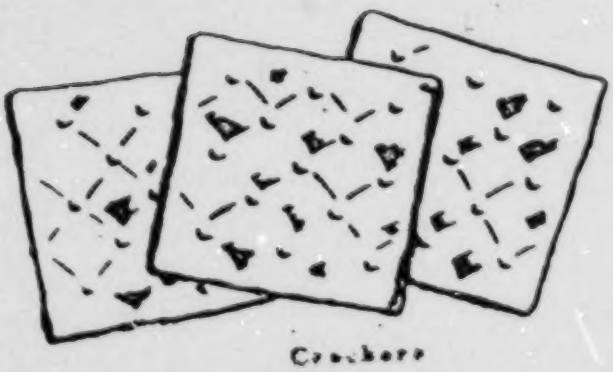
C. Chicken

D.



Sweet Potato

E.



Crackers

NOTES

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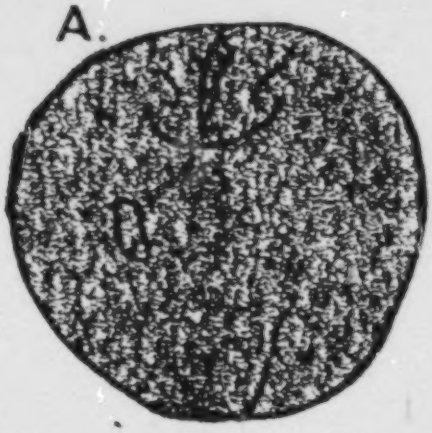
13. Select three of these foods for an after-school snack that will give you lots of vitamins.

onated Beverage

A.



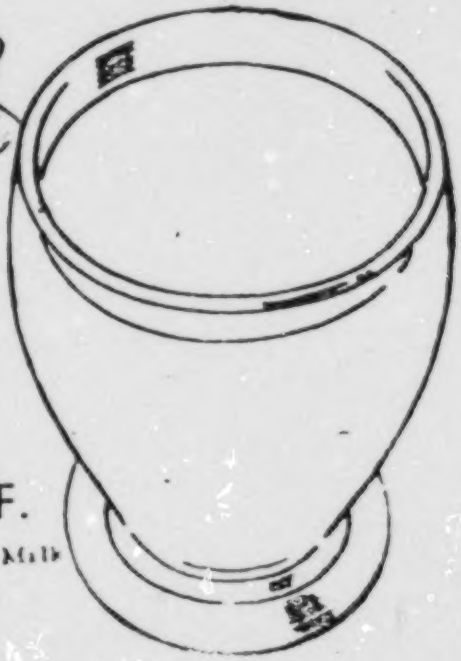
Apple

B.

Peanut Butter Sandwich

D

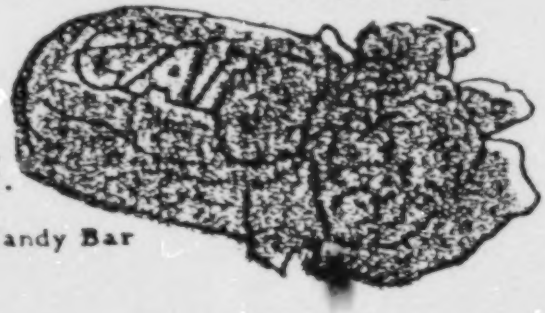
Potato Chips



F.

Milk

E.



Candy Bar

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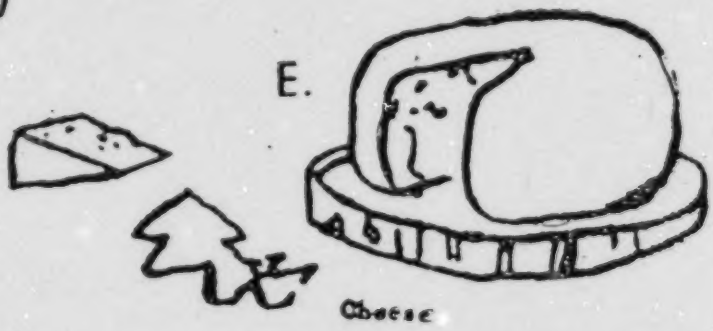
4. Which of these foods are made from milk? Select two.

A.

B.

C.

E.



NOTES

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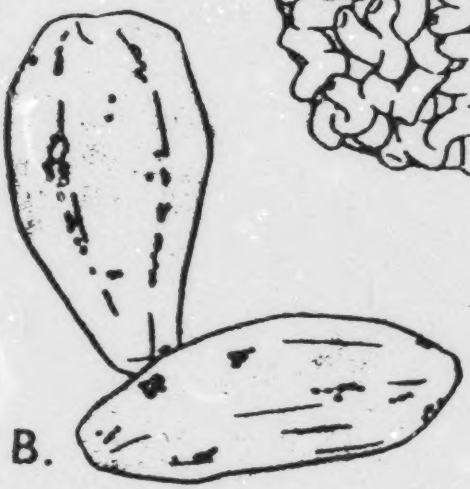
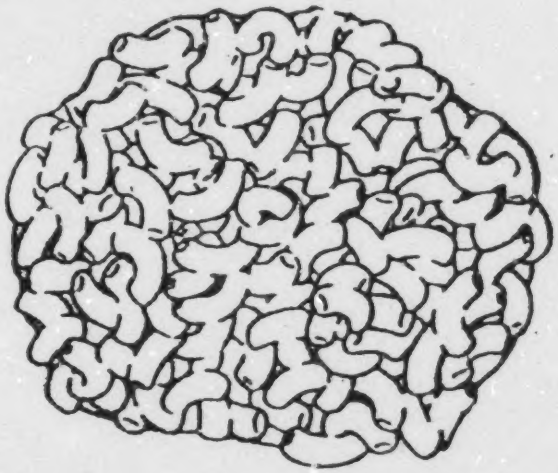
15. Which of these foods are found in the vegetable and fruit group in the "Daily Food Guide"? Select three.

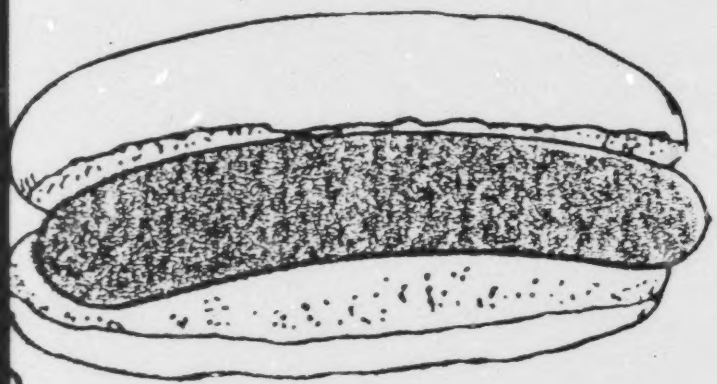
A. Broccoli



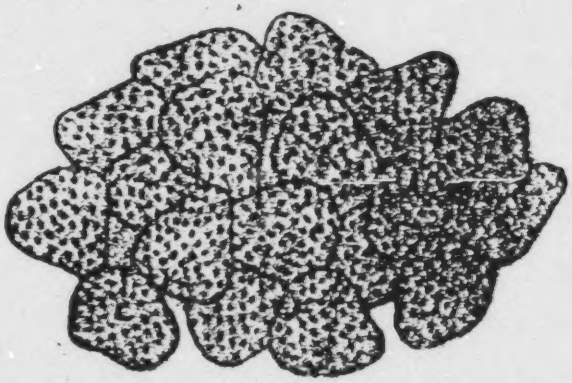
B. Sweet Potato



C. Macaroni



D. Frankfurter on Enriched Bun



E. Strawberries

Visual Products Division 3M

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16. If you have gained a lot of weight or if you weigh a lot more than the average for your age, which of these foods would be best for you to eat as an after-school snack? Select two.

A. Cookies

B. Tomato Juice

C. Assorted Nuts

D. Candy Bar

E. Carrots

F. Soft Drink

NOTES

NUTRITION EDUCATION PRE-POST TEST

7th Grade

The following questions and choices were shown on transparencies, and read twice to each group. Students marked their choices on an answer sheet (attached). This test was used with the 8th grade control groups, also.

1. A variety of foods is needed by the body because: (1)

   *A. No one food contains all the needed nutrients
   B. Food will cost less
   C. Most foods cannot be stored

2. When your diet is adequate, how are foods eaten from the meat group used in your body? (1)

   A. As a body regulator
   *B. As a body builder
   C. As a body fuel

3. The Recommended Daily Dietary Allowances guide provides information you can use to determine which two of the following: (2)

   *A. Amounts of nutrients in foods
   B. Recommended way to prepare foods you need
   *C. Amount you need of each nutrient

4. Which three food nutrients listed must be changed by the process of digestion before they can be used by the cells in your body? (3)

   A. Vitamins
   *B. Carbohydrates
   C. Minerals
   *D. Proteins
   *E. Eats

5. If you do not eat recommended amounts and kinds of foods needed, you may... select three (3).

   *A. Become overweight or too skinny
   *B. Be likely to have colds
   *C. Become tired
   D. Be full of energy

6. Which of these foods are grown in this part of North Carolina? Select seven (7).

   A. Pineapple
   *B. Sweet Potato
   *C. Strawberries
   D. Orange
   *E. Corn
   *F. Tomato
   *G. Pork
   *H. Collards
   *I. Peanut

7. Select four of the following food which are rich sources of minerals you need for developing bones, teeth, hair, and blood. (4)

A. Grapes
*B. Fried fish
*C. Cheese
*D. Eggs
*E. Broccoli
F. Corn

8. Which of the people in each pair would need to eat foods which provide a higher number of calories in their daily diet? (2)

*A. 1. Playing ball
B. 1. Overweight
A. 2. Brushing teeth
*B. 2. Skinny

9. If you want fewer calories which food in each of these groupings would you select to include in your daily meals? (3)

A. 1. French fried potatoes
B. 1. Green peas
C. 1. Cantaloupe
*A. 2. Boiled potatoes
B. 2. Lima beans
*C. 2. Orange
A. 3. Potato salad
*B. 3. Green snap beans
C. 3. Banana

10. Match the number of each of the vegetables or fruits with its name written on your answer sheet. (6)

Acorn Squash (E)
Beet (D)
Broccoli (A)
Cauliflower (C)
Okra (F)
Pineapple (B)

11. Match the letter for each of these foods with the correct food group listed on the answer sheet. (8)

Bread Group (B,H,)
Fruits and Vegetables Group (C,F)
Milk and Milk Products Group (A,G)
Meat Group (D,E)

A. Custard
B. Corn bread
C. Brussel sprouts
D. Fried egg
E. Pork chop
F. Peach
G. Cottage cheese
H. Macaroni

12. Which of these practices are <u>not</u> recommended for storing cooked food? Select two (2).

*A. Uncovered on counter
B. Covered in refrigerator
*C. Uncovered in oven

13. Select four of the characteristics that will affect the total amount of food you will need to eat each day. (4)

A. How much money you have
*B. Which sex you are
*C. The kinds of activities you do
*D. The condition of your health
E. The kind of house you live in
*F. How old you are

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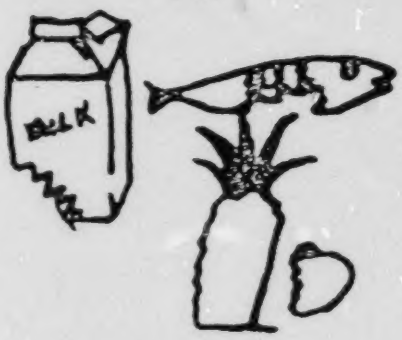
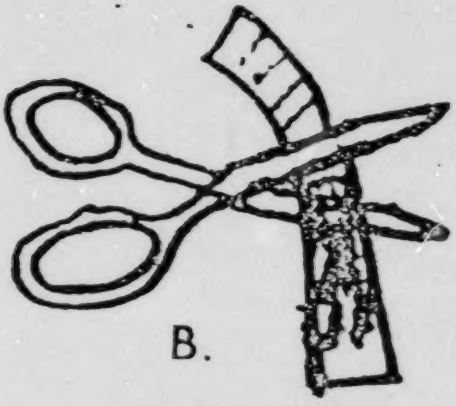
1. A variety of foods is needed by the body because:

A.





B.

C.

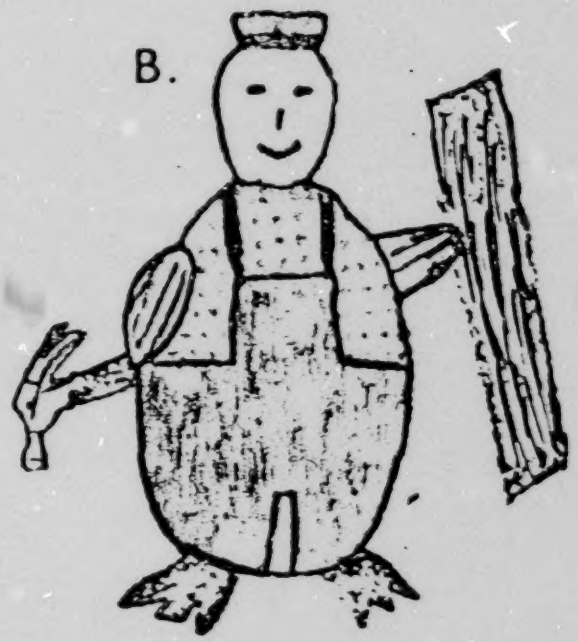
NOTES

2. When your diet is adequate, how are foods eaten from the meat group used in your body?

A.

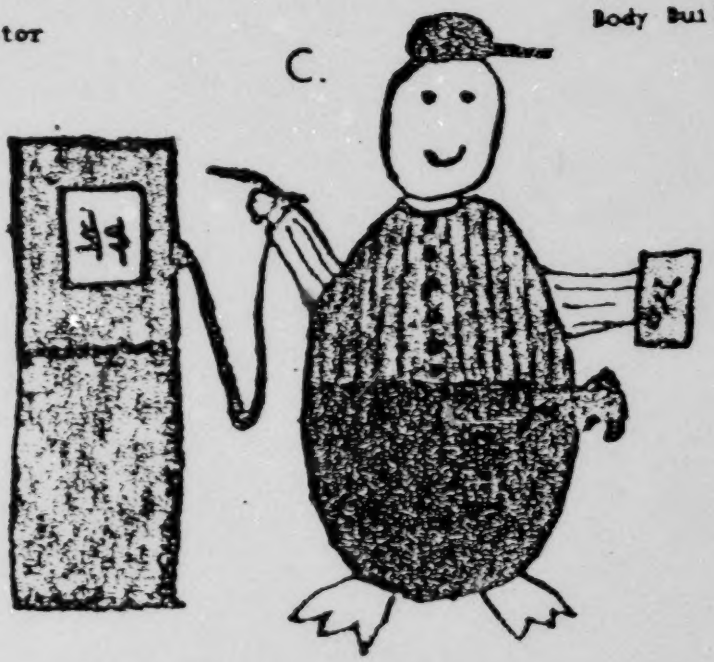
Body Regulator

B.



Body Builder

C.



Body Fuel

NOTES

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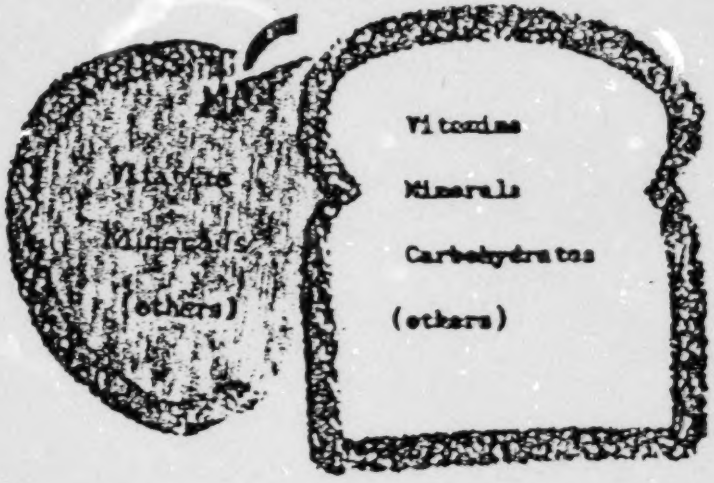
3. The Recommended Daily Dietary Allowances guide provides information you can use to determine which two of the following:

A.



B.

C.

NOTES

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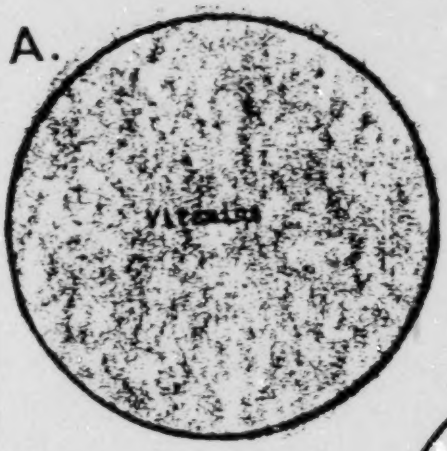
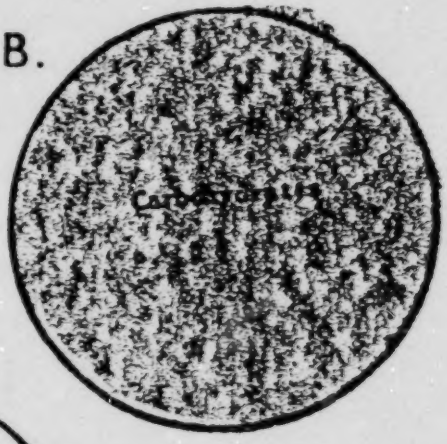
4. Which three food nutrients listed must be changed by the process of digestion before they can be used by the cells in your body?

A.

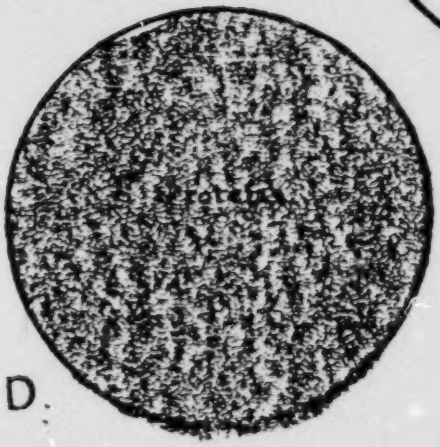


B.



C.

D.



E.

NOTES

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5. If you do not eat recommended amounts and kinds of foods needed, you may: Select three.

B.

C.

D

NOTES

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6. Which of these foods are grown in this part of North Carolina? Select seven.

A. Pineapple

B. Sweet Potato

C. Strawberries

D. Orange

E. Corn

F. Tomato

G. Pork

H. Collards

I. Peanut

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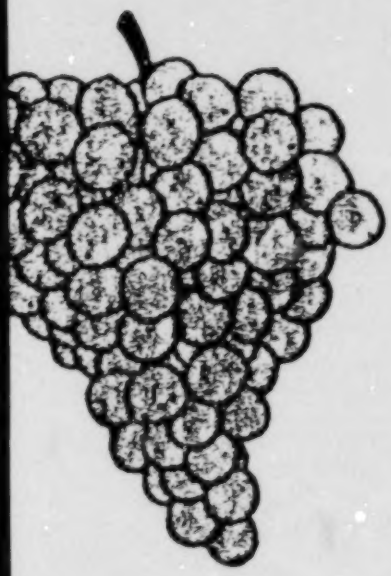
. Select four of the following foods which are rich sources of minerals you need for developing bones, teeth, hair, and blood.

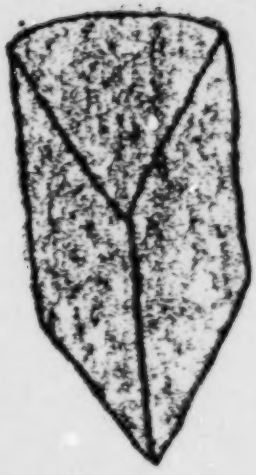


Grapes

B.

Fried Fish

C.



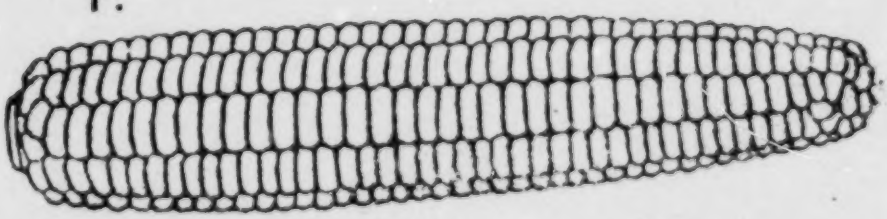
Cheese

D.

Eggs

roccoli

F.



Corn

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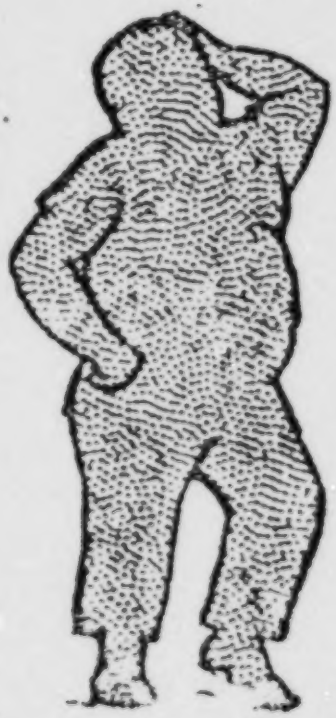
8. Which of the people in each pair would need to eat foods which provide a higher number of calories in their daily diet?

A1.

A2.

B1.



B2.

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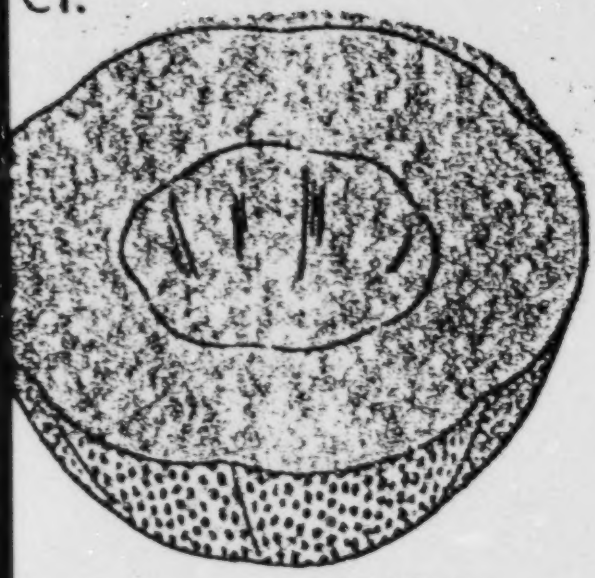
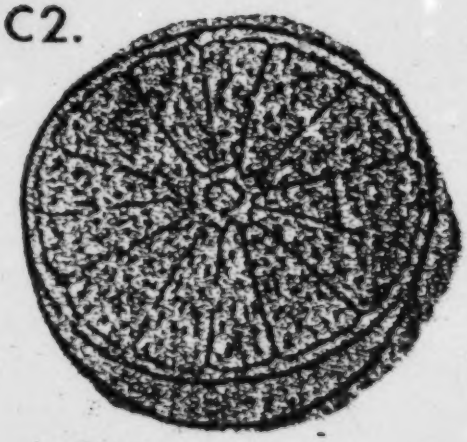
If you want fewer calories which food in each of these groupings would you select to include in your daily meals?

C1.



Cantaloupe

C2.



Orange

C3.

Banana

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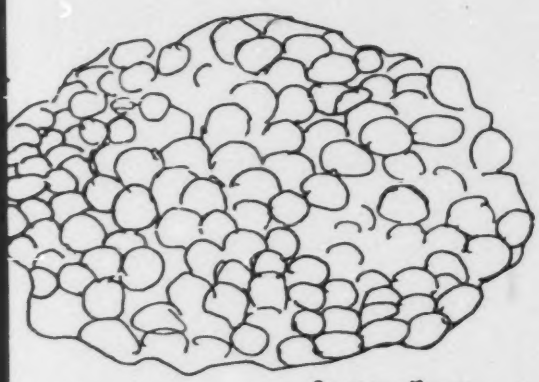
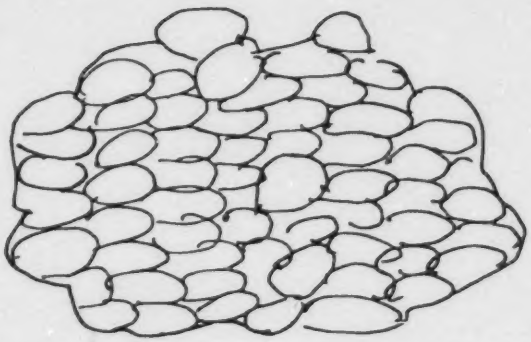


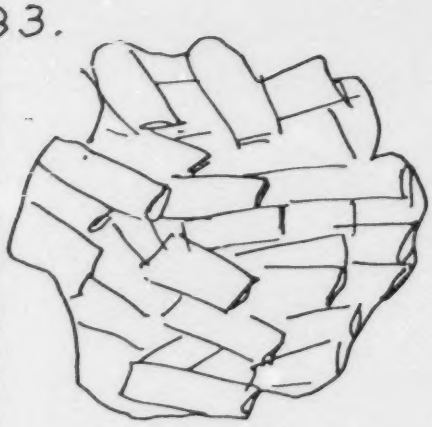
Green Peas

B2.



Lima Beans

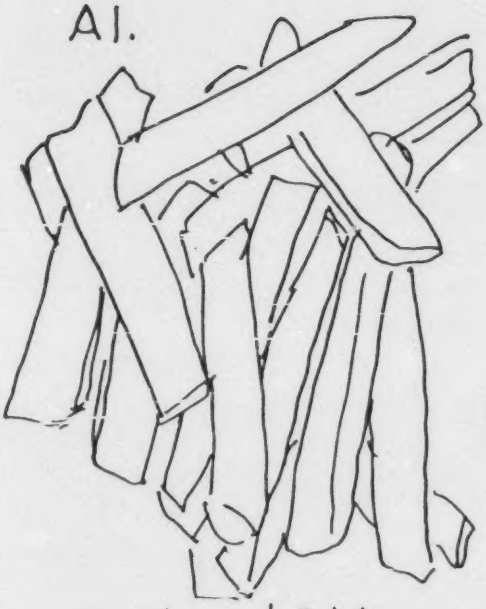
B3.



Green Snap Beans

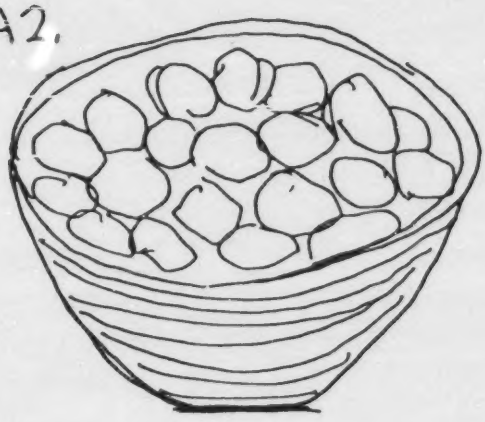
BEST COPY AVAILABLE

A1.



French Fried Potatoes

A2.



Boiled Potatoes

A3.

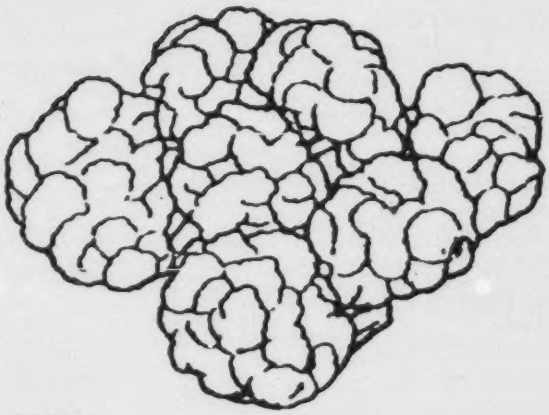
Potato Salad

BEST COPY AVAILABLE

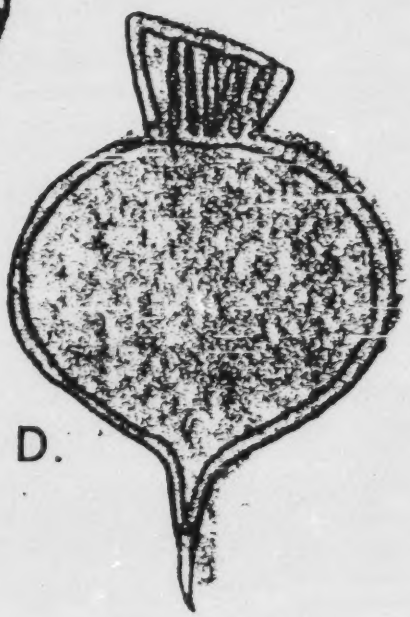
10. Match the letter of each of the vegetables or fruits with its name written on your answer sheet.

B.

C.



D.



F.

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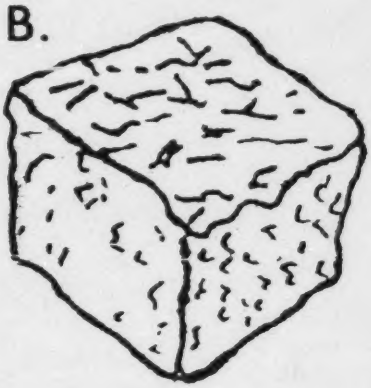
11. Match the letter for each of these foods with the correct food group listed on the answer sheet.

A.

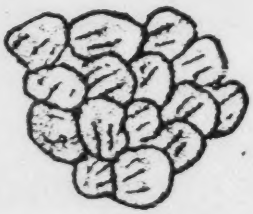
Custard

B.



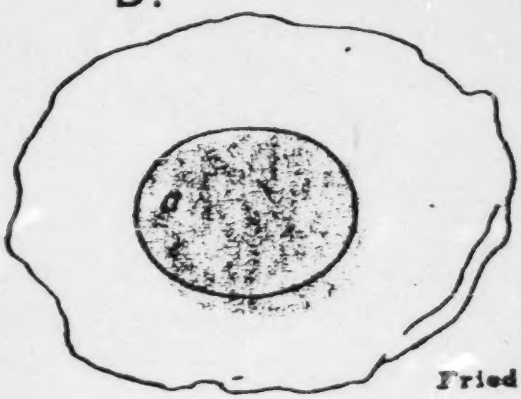
Corn bread

C.



Brussel Sprouts

D.

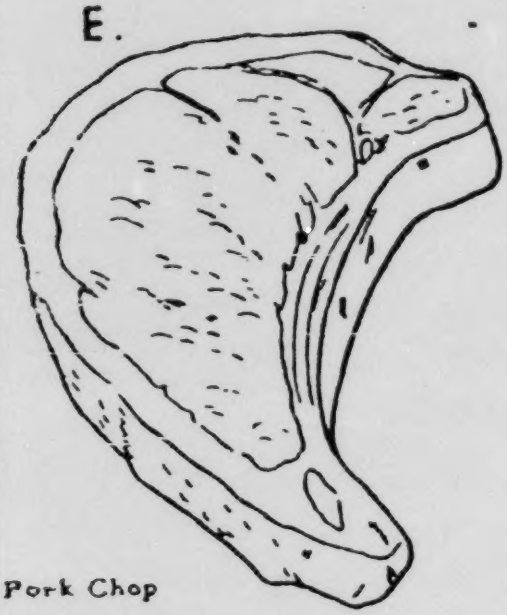


Fried Egg

BEST COPY AVAILABLE

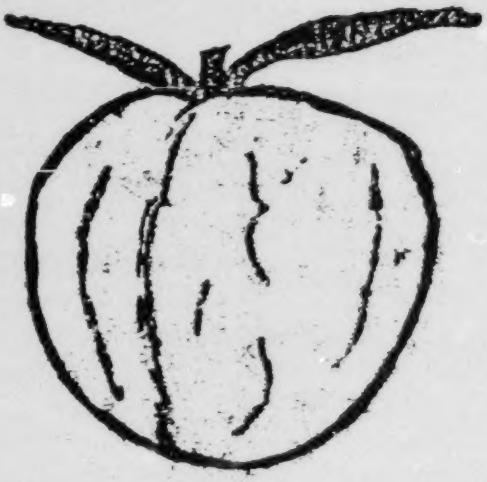
11. Match the letter for each of these foods with the correct food group listed on the answer sheet.

E.



Pork Chop

F.

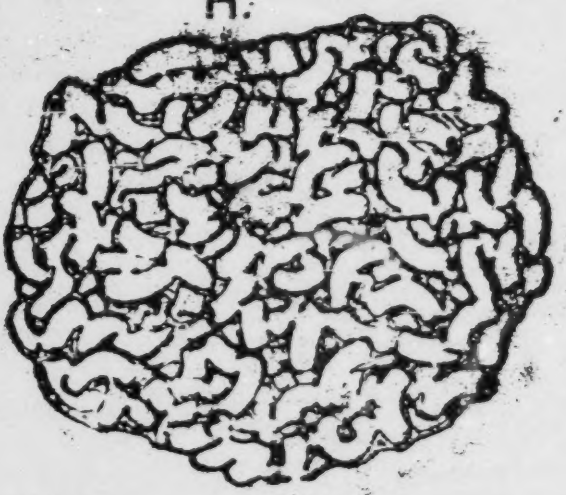


Peach

G.

Cottage Cheese

H.

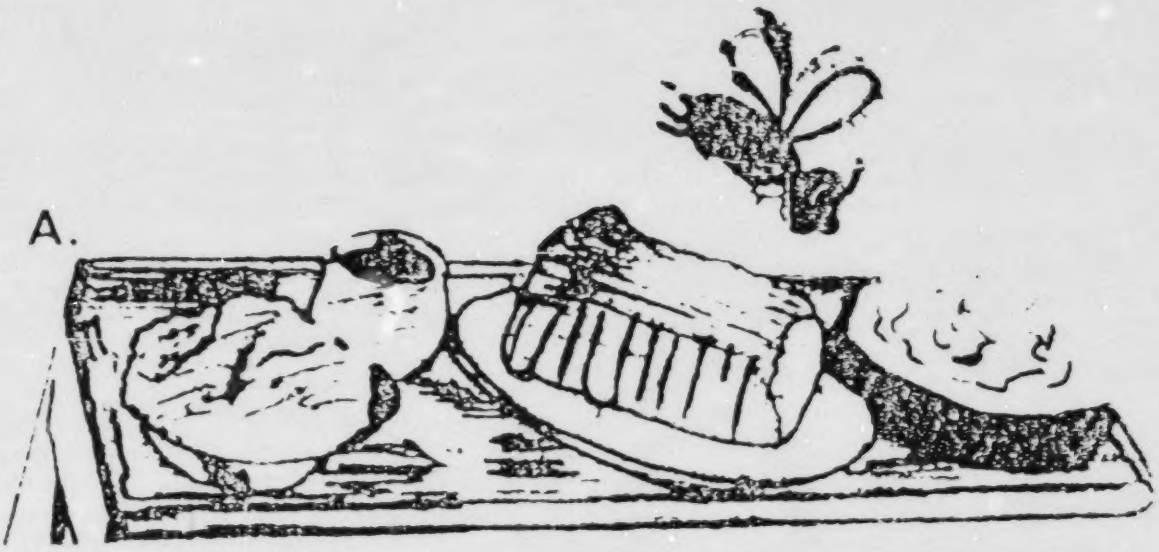


Macaroni

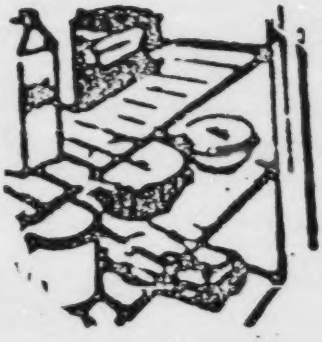
BEST COPY AVAILABLE

12. Which of these practices are not recommended for storing cooked food? Select two.

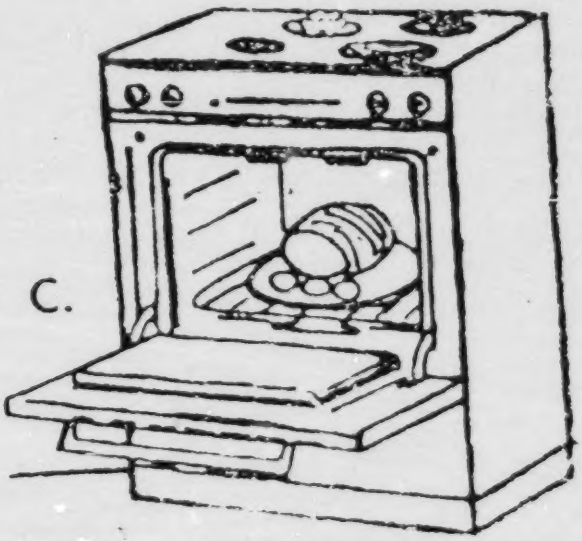
A.



B.

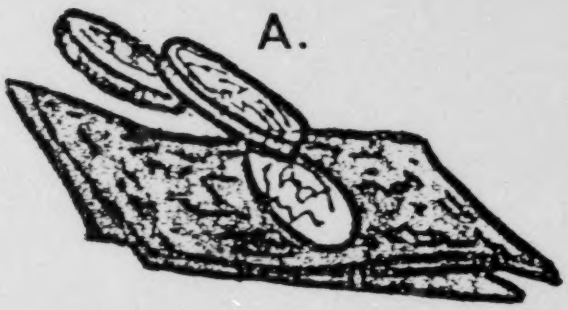


C.



13. Select four of the characteristics that will affect the total amount of food you will need to eat each day.

A.

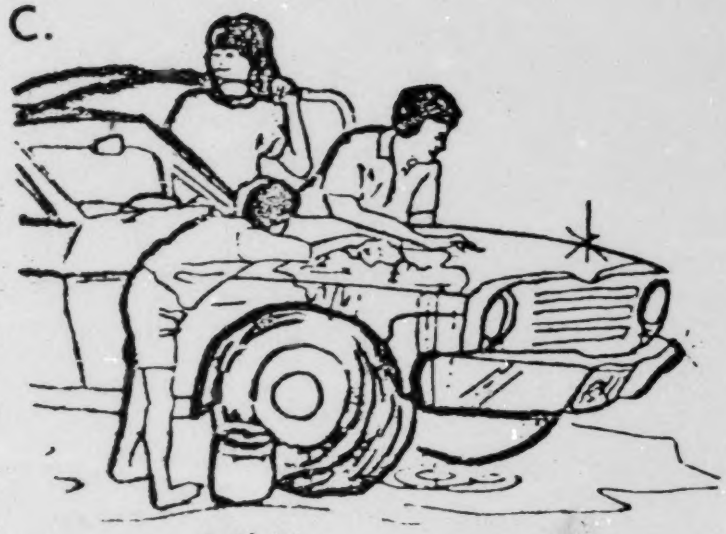


Money

B.

Sex

C.



Activity

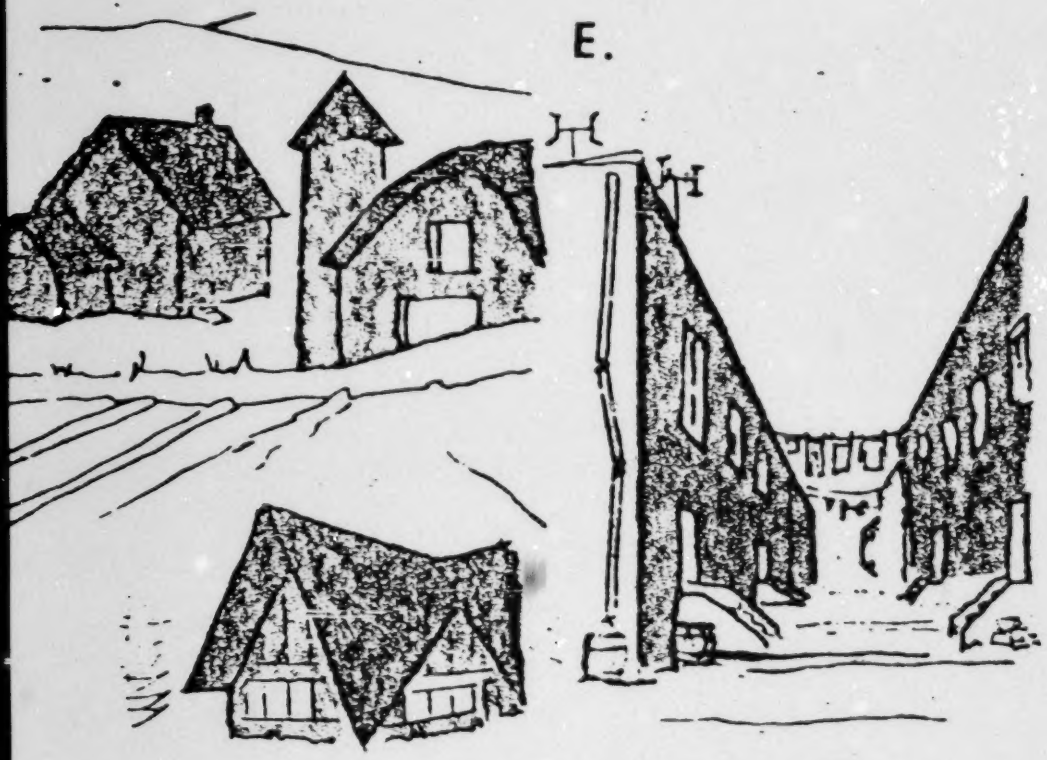
D.

Health

BEST COPY AVAILABLE

3. Select four of the characteristics that will affect the total amount of food you will need to eat each day.

E.



F.

NUTRITION EDUCATION

Pretest for 10th Graders

I. Find the word in the right column which fits each of the descriptions or definitions in the left column. Write the number of the word on the answer sheet in the space by the letter of the description it fits. A word from the list may be used more than once.

a. The science of dealing with the food eaten and how the body uses it.

b. Lack of proper food.

c. Mineral necessary for the formation of bones and teeth.

d. Element essential for proper functioning of the thyroid gland.

e. Red coloring matter in the blood.

f. A disease which may be caused by a shortage of red corpusles.

g. A part of protein.

h. Fuel food for the body.

i. A unit of measure of heat energy in food.

j. A form of carbohydrate stored in the liver until needed by the body.

k. Undigested material which forms bulk in the diet and is useful for normal elimination.

l. Any substance which furnishes energy, builds and repairs the body, or regulates the body processes.

m. Builds, maintains and repairs body tissue.

n. Chemical regulators found in foods which stimulate growth and other body activities and prevents deficiency diseases.

o. General term that includes sweet, starchy and cellulose foods.

p. A disease which may be caused from a lack of vitamin C in the diet.

1. Anemia
2. Amino acid
3. Calcium
4. Calorie
5. Carbohydrate
6. Glycogen
7. Hemoglobin
8. Scurvy
9. Iodine
10. Nutrient
11. Malnutrition
12. Cellulose
13. Vitamins
14. Nutrition
15. Protein

II. Use the answer sheet to complete the following statements by placing an X in front of each ending which makes the statement true. (Statements have more than one ending)

1. The main classes of food nutrients which regulate and protect body functions are:

   a. Fats
   b. Carbohydrates
   c. Minerals
   d. Vitamins
   e. Protein

2. The main classes of nutrients which supply energy (calories) to the body are:

   a. Amino acids
   b. Sucrose
   c. Cellulose
   d. Fats
   e. Carbohydrates

3. During pregnancy, in order to supply the developing fetus and to prevent depletion of the mother, there is a greater need for:

   a. Vitamins
   b. Carbohydrate
   c. Protein
   d. Minerals
   e. Fat

4. Important contributions of the B-vitamins include:

   a. helping us to see in the dark
   b. helping build strong bones and teeth
   c. helping our bodies maintain healthy nerve tissue
   d. forming cementing substance for our cells
   e. helping our bodies to properly use carbohydrates, proteins, and fats.

5. From the 1965-66 survey by the U. S. D. A. in the households of the U. S. A. some trends in eating habits shown were:

   a. Snacks were decreasing in popularity.
   b. Differences in regional food patterns are becoming more distinct.
   c. Foods that require less preparation in the home are gaining favor.
   d. Families at all income levels are eating less meat, poultry, and fish
   e. Household consumption of milk and milk products and fruits and vegetables declined between 1955 and 1965.

6. Symptons of under nutrition:

   a. Loss of weight
   b. Sallow complexion
   c. Overweight
   d. Frequent colds
   e. Decaying teeth
   f. Healthy, glossy hair
   g. Poor night vision

7. The four major food groups which form a foundation for a well balanced diet are:

   a. Milk and milk products.
   b. Carbohydrates: starch, sugar, cellulose.
   c. Lean meats of all kinds, eggs, poultry, and fish. As alternates -- dry beans, dry peas, lentils, nuts, peanuts, and peanut butter.
   d. Fruits and vegetables --especially those rich in Vitamin B. and C.
   e. Citrus fruits: oranges, lemons, grapefruit, tangerines, etc.
   f. Fats: butter, margarine, cream, olive oil and other oils and fats.
   g. Whole grain, enriched, and restored breads and cereals.

8. Good sources of iron are:

   a. Milk
   b. Cheese
   c. Liver
   d. Muscle meat
   e. Egg yolk
   f. Celery
   g. Cucumbers

III. The following statements are false. In the space provided on the answer sheet, list the word or at most, two words, which makes the statement false in the column labeled "wrong". In the column labeled "correct" write the word which should replace the wrong word in order to make the statements true, or specify if the incorrect words should just be left out.

1. Needs for nutrients are greatest during periods of slow growth.

2. According the USDA surveys of 1965-1966 and 1968, calcium and iron were the nutrients consumed in proportions most below the Recommended Allowances.

3. Butter is made from milk; it is a good source of calcium.

4. The Type A lunch is designed to provide one-half of the Recommended Allowance of most nutrients.

5. There is need for many more calories during the whole course of pregnancy, since the mother is eating for two.

6. Steak has a much better quality protein than ground beef.

7. Milk made from dry milk is not as good as fresh milk for getting most nutrients.

8. Dried beans and peas are inexpensive sources of protein and therefore are not good sources of protein as a substitute for meat.

9. Keeping in mind the present costs of foods, it is impossible to obtain a balanced diet on a low income.

IV. 1. List four reasons why some people do not eat balanced diets.

2. List four community resources from whom you could obtain information when studying foods and nutrition.

APPENDIX B

Sample Forms for Gathering Dietary Recall Data

At

Two Age Levels

Dietary Recall Scoring Procedures

RECORD OF FOOD EATEN

FIFTH GRADE

Name		Date	School	
Age	Sex M F	Height (w/o shoes) Inches	Weight	Homeroom Teacher	Grade

Foods and Drinks Eaten (Everything That Was Swallowed)

	Name and Description of Food	How Much Did You Eat
What did you eat or drink on your way home yesterday and when you got home?		
What did you eat or drink for dinner last night?		
What did you eat or drink after dinner last night? Before you went to bed?		
What did you eat or drink before school today or for breakfast at school?		
What did you eat or drink between breakfast and lunch?		
What did you eat or drink for lunch today?		

Please check where the following meal was eaten.

	Purchased At School	Ate at Home	Brought from Home	Purchased Elsewhere
Breakfast				
Lunch				

On other side, list some foods you like and some you do not like.

RECORD OF FOOD EATEN

Seventh & Tenth Grade

NAME	DATE	SCHOOL

Age	Sex M F	Height (w/o shoes)	Weight	Phys. Ed. Teacher	Period

Time at Which Food & Drink Was Comsumed	Foods & Drinks Consumed (All that was Swallowed) Time	Name & Description of Food	How Much (Estimate)
Between Noon & Evening Meal Yesterday			
Evening Meal Yesterday			
After Evening Meal Yesterday			
Breakfast Today			
Between Breakfast & Noon Today			
Lunch Today			

Please check where the following meal was eaten.

	Purchased at School	Ate at Home	Brought from Home	Purchased Elsewhere
Breakfast				
Lunch				

DIETARY RECALL SCORING PROCEDURES

1. Circle each food on each page of the dietary recall using a colored pen for each food group of the Basic Four.

Milk	Red	Meat	Black
Vegetable & Fruit	Green	Bread & Cereal	Blue

2. Use the approved list of USDA foods for school lunches[ξ] to mark an A or C or both beside foods adequate in Vitamins A or C.

3. Count number of servings for each food group using total minimum serving requirements for the three days and multiply the food group total by four. Record score for each group in corresponding color on front page of dietary recall. Add the food groups. Maximum number of points allowed for three days dietary intake.

	5th & 7th Grade			10th Grade		
	Minimum Servings		Total Points	Minimum Servings		Total Points
	Daily	3		Daily	3	
Milk	3	9	36	4	9	48
Meat	2	6	24	2	6	24
Veg. & Fruit	4	16	48	4	16	48
Bread & Cereal	4	16	48	4	16	48

4. Count number of times Vitamin A and Vitamin C foods were eaten during the three days. Use the following table to subtract points for lack of adequate servings of Vitamin A or C from the food group total to obtain final score.

	NUMBER OF SERVINGS IN THREE DAYS			
	0	1	2	3
Vitamin A	-2	-1	OK	
Vitamin C	-3	-2	-1	OK

5. Using one day dietary recall multiply the total for each food group by three. Add totals for final score.

6. Using two day dietary recall divide the total for each group by two and multiply answer by three. Add totals for final score.

7. Score Vitamins A and C on the basis of score for one or two days.

[ξ] A Menu Planning Guide for Type A School Lunches. US Dept. of Agriculture Consumer & Marketing Services PA-719 May 1966.

APPENDIX C

Statistical Analyses of Data

NUTRITION EDUCATION PROJECT

1970-71

Summary Statements of Test Results

A. Biology Classes

1. Approximately 8 percent more students in the project group had improved their scores between the pre and post test dates.

Project group	-67.5%
Control group	-59.6%
	7.9%

2. Over 5% more students in the project groups (10%) had maintained the same score on pre and post tests than in the control groups (4.5%).

3. A smaller percentage of students in the project group had increased the number of errors on their post test scores than in the control group.

Project group:	22.5%
Control group:	35.9%

4. a. For the project group, test scores improved from 1 to 14 points for over two-thirds of the students. (67.5%)

   b. For the control group, test scores improved from 1 to 18 points for about three-fifths of the students (59.6%)

B. Seventh Grade Classes

1. Approximately 18 percent more students in the project group had improved their test scores between the pre and post test dates.

Project group	-67%
Control group	-51%
	16% more

2. About 4 percent more students in the control group had maintained the same score on pre and post tests than in the project group.

Control group	-10%
Project group	-6%
	4% more

3. A smaller percentage of students in the project group had increased the number of errors on their posttest scores than in the control group.

Control group	-39%
Project group	-27%
	12% less

4. a. For the project group, test scores had improved from 1 to 13 points for over two-thirds of the students. (67%)

   b. For the control group, test scores had improved from 1 to 14 points for only one-half of the students. (51%)

C. Fifth Grade Classes

1. Approximately 22 percent more students in the project group had improved their scores between the pre and post test dates.

Project group	-88%
Control group	-66%
	22% more

2. Approximately 16 percent more students in the control group had maintained the same score on pre and post tests than in the project group.

Control group	-24%
Project group	-8%
	16% more

3. A smaller percentage of students in the project group had increased the number of errors on their posttest scores than in the control group.

Project group	-5%
Control group	-10%

4. a. For the project group, test scores had improved from 1 to 13 points for almost 9 out of every 10 students. (88%)

   b. For the control group, test scores had improved from 1 to 8 points for about 6 out of every 10 students. (66%)

ANALYSES OF VARIANCE

Analyses of variance were performed on the differences between pretest and posttest scores for dietary recall, test of knowledge of nutrition, and TOUS for each of the participating schools. We believe ourselves justified in testing these differences since (1) we are trying to evaluate the effectiveness of the nutrition education programs we instituted and (2) very few pretest scores were so close to the maximum possible score as not to allow considerable room for improvement.

For each test in each school, observations were classified into two groups: those on students receiving nutrition education (hereafter designated NE) and those on students not receiving nutrition education (designated NEC). In some cases, finer classifications were developed and analyzed. In one case, no data on an NEC groups was available; the equivalent of a "paired-data t-test" was performed and the results must therefore be interpreted with extra caution.

Differences between mean changes in scores that are statistically significant at the .05 level are indicated by asterisks. Conclusions are summarized below the tables.

Results for the dietary recall procedures tend to defy interpretation. It is doubtful that the scores actually measure"improvement" in eating habits; they are as likely to reflect seasonal variation in sheer amount of food consumed or improvement in remembering what was eaten as to indicate the students' implementation of newly acquired notions about nutrition. Further confounding of the results may have occurred if students, more aware of nutrition in the spring than in the fall, tended to record on the posttest what they thought they should have eaten rather than what they did eat.

Tabl. 28. Analyses of variance of tests of knowledge of nutrition in October and April.

Rocky Mount Senior High

Means of Differences

	Means	No. of Observations
NE (Teacher 1)	3.39	46
NE (Teacher 2)	3.00	34
NEC (Teacher 1)	1.28	39
NEC (Teacher 2)	3.15	27

Weighted ANOVA

Source	DF	SS	MS
Between NE and NEC groups	1	50.32	50.32
Between teachers	1	14.64	14.64
Interaction	1	43.91	43.91
Within classes	142	7470.26	52.61
Total (corrected)	145	7579.13	

No significant differences apparent.

Parker Junior High

Means of Differences

	Means	No. of Observations
NE	2.11	56
NEC	3.56	27

ANOVA

Source	DF	SS	MS
Between NE and NEC groups	1	38.22	38.22
Within groups	81	1282.02	15.83
Total (corrected)	82	1320.24	

No significant difference between NE and NEC groups.

Table 28.Continued

Braswell

Means of Differences

	Means	No. of Observations
NE (Teacher 1)	2.58	24
NE (Teacher 2)	3.50	26
NEC	.64	25

ANOVA

Source	DF	SS	MS
Among classes	2	108.09	54.05
Between NE and NEC groups	1	97.61	97.61*
Between classes in NE group	1	10.49	10.49
Within classes	72	486.09	6.75
Total (corrected)	74	594.19	

Significant difference between NE and NEC groups; no significant difference between the two classes receiving nutrition education.

Nashville

Means of Differences

	Means	No. of Observations
NE (Teacher 1)	2.69	29
NE (Teacher 2)	4.55	22
NEC (Teacher 3)	2.12	25
NEC (Teacher 4)	2.29	28

Table 28. Continued

ANOVA

Source	DF	SS	MS
Between NE and NEC groups	1	42.76	42.76*
Between classes within groups	2	43.45	21.72see note
Within classes	100	954.02	9.54
Total (corrected)	103	1040.22	

Significant difference between NE and NEC groups; although no significant difference between Teacher 3's and Teacher 4's classes, Teacher 1's class and Teacher 2's class do differ significantly (4.55 - 2.69 = 1.86, which is greater than the "least significant difference," 1.73).

North Edgecombe

Means of Differences

	Means	No. of Observations
NE (Teacher 1)	1.92	28
NE (Teacher 2)	1.52	21
NNE (Teacher 3)	1.00	11
NNE (Teacher 4)	-1.65	20
NNE (Teacher 5)	-1.14	21

ANOVA

Source	DF	SS	MS
Between NE and NEC groups	1	175.79	175.79
Among classes within groups	3	54.15	18.05
Within classes	96	1584.22	16.50
Total (corrected)	100	1814.16	

Small but significant difference between NE and NEC groups; no significant differences among classes within groups.

Table 29.Analysis of variance of TOUS test given in October and April.

Means of Differences

	Means	No. of Observations
NE	.488	82
NNE	-.486	74

ANOVA

Source	DF	SS	MS
Between NE and NEC groups	1	36.92	36.92
Within groups	154	4102.97	26.64
Total (corrected)	155	4139.90	

No significant difference between NE and NEC groups.

Table 30 Analyses of variance of total dietary recall scores in October and April.

Rocky Mount Senior High

Means of Differences

	Means	No. of Observations
NE	9.37	81
NEC	9.53	59

ANOVA

Source	DF	SS	MS
Between NE and NEC groups	1	00.82	0.82
Within groups	138	65165.60	472.21
Total (corrected)	139	65166.42	

No significant difference between NE and NEC groups.

Parker Junior High

Means of Differences

	Means	No. of Observations
NE	13.61	46
NEC	-1.35	26

ANOVA

Source	DF	SS	MS
Between NE and NEC groups	1	3715.0	3715.0*
Within groups	70	33366.8	467.7
Total (corrected)	71	37081.9	

NE group displayed significantly more improvement than NEC groups.

Table 30 Continued

Braswell

Means of Differences

	Means	No. of Observations
NE (Teacher 1)	6.57	23
NE (Teacher 2)	23.54	24
NEC	5.00	24

ANOVA

Source	DF	SS	MS
Among classes	2	5048.8	2524.4
Between NE and NEC groups	1	1664.0	1664.0
Between NE classes	1	3384.8	3384.8*
Within classes	68	39967.6	587.8
Total (corrected)	70	45016.4	

No significant difference between NEC group (as a whole); Teacher 2's class improved significantly more than Teacher 1's class.

Nashville

Means of Differences

	Means	No. of Observations
NE (Teacher 1)	10.55	31
NE (Teacher 2)	18.32	25
NEC	23.93	60

ANOVA

Source	DF	SS	MS
Among classes	2	3683.7	1841.8
Between NE and NEC groups	1	2847.8	3847.8*
Between NE classes	1	835.9	835.9
Within classes	113	63238.9	559.6
Total (corrected)	115	66922.5	

NEC groups increased their scores, on the average, significantly more than the NE group did.

Table 30 Continued

North Edgecombe

Means of Differences

	Means	No. of Observations
NE	17.7	18

(pretest mean = 100.8; posttest mean = 83.1)

ANOVA Represented as raw pre and post test scores rather than as differences

Source	DF	SS	MS
Between pre and post tests	1	2826.7	1098.0*
Among students	17	18666.3	2826.7
Residual	17	6247.8	367.5
Total (corrected)	35	27740.8	

Dietary recall scores, on the average, rose significantly from pretest to posttest.

Table 31 Analyses of differences in dietary recall scores for four food groups, Vitamin A and Vitamin C

Braswell School
Means of Differences

	Number of Observations	Means					
		Milk	Vegetables and Fruit	Meat	Bread	Vit. A	Vit. C
NE(Teacher 1)	23	.43	.00	-.09	6.52	-.61	.30
NE(Teacher 2)	24	5.75	2.17	1.92	13.25	-.04	.50
NEC	24	2.08	-5.00	1.33	6.75	.12	.29

Combined ANOVA

Source	DF	SS						MS					
		Milk	Veg. & Fruit	Meat	Bread	Vit. A	Vit. C	Milk	Veg & Fruit	Meat	Bread	Vit. A	Vit. C
Among Classes	2	349.85	647.54	49.65	695.12	6.91	8.14	174.92	323.77	24.83	347.56	3.46	4.07
Between NE & NEC groups	1	18.04	592.41	2.51	163.44	3.13	7.69	18.04	592.41	2.51	163.44	3.13	7.69*
Between classes in NE group	1	331.81	55.13	47.14	531.68	3.78	.45	331.81	55.13	47.14	531.68	3.78	.45
Within classes	68	8357.99	13583.00	1797.00	9350.70	79.06	77.83	122.91	199.75	26.43	137.51	1.16	1.14
Total(corrected)	70	8707.83	14231.00	1846.60	10045.90	85.97	85.97						

NE and NEC groups differed significantly in mean change of Vitamin C scores; no other significant differences appear.

A multivariate analysis of variance (not reported here) bears out the results of the component and total dietary recall score analyses presented.

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Table 31 Continued

Means of differences

	Number of Observation	Milk	Vegetables and Fruit	Meat	Bread	Vit. A	Vit. C
NE (Brewer)	31	-.16	3.75	.19	5.87	.23	.68
NE (Matthews)	25	3.12	7.76	2.64	3.44	1.04	.32
NEC	60	3.80	5.73	2.07	9.83	1.06	1.43

Combined ANOVA

Source	DF	SS						MS					
		Milk	Veg. & Fruit	Meat	Bread	Vit. A	Vit. C	Milk	Veg. & Fruit	Meat	Bread	Vit. A	Vit. C
Among Classes	2	329.5	224.56	100.50	819.8	15.78	26.04	164.8	112.28	50.25	409.0	7.89	13.02
Between NE & NEC groups	1	180.5	1.13	17.67	738.0	6.60	24.28	180.5	1.13	17.67	738.0*	6.60*	24.28*
Between classes in NE group	1	149.0	223.43	82.83	81.8	9.18	1.76	149.0	223.43	82.83	81.8	9.18*	1.76
Within classes	113	10506.4	18364.2	3336.3	13346.0	160.1	182.9	92.98	162.52	29.53	119.0	1.42	1.62
Total (corrected)	115	10836.0	18588.8	3436.8	14265.8	175.9	209.0						

NEC group showed, on the average, significantly higher gains on bread, vitamin A and vitamin C scores than the NE groups (as a whole).

Within the NE group, Matthew's class's scores for vitamin A rose, on the average, significantly more than Brewer's class's scores.

A multivariate analysis of variance (performed but not shown) lends added credence to these results.

ANALYSIS OF NUTRITION EDUCATION DATA '71-'72

An analysis of variance was performed on the data obtained from the nutrition education study on children in grades 1-3 (excluding Nashville). The underlying model used in the analysis was assumed to be linear and consisted of 11 components. These are illustrated in Table 32. Further assumptions in the analysis were that the students in each class represented a random sample of students from some larger population. The classes in each school represented a random sample of possible classes and the schools represented a random sample of possible schools that could have been used in the study. In all three grades, it was assumed that inferences would be restricted to the questions used, i.e., the questions were not treated as a random sample from a large number of possible questions even though the pupils in grade 1 received only a subset of the questions given to pupils in grades 2 and 3.

The analysis is in terms of components of variation, defined in terms of the symbols given in Table 1. These are as follows:

$$\sigma^2_Q = \sum_{i=1}^{m} Q_i^2/m \quad ,$$

$$\sigma^2_{TQ} = \sum_{i=1}^{m} (TQ)_i^2/m \quad , \qquad ,$$

where m = 16 in grade 1 and 30 in grades 2 and 3. We also have $\sigma^2_{T(S)}$, $\sigma^2_{T(QS)}$, $\sigma^2_{TS(QC}$, $\sigma^2_{TSC(I)}$, and $\sigma^2_{TSC(QI)}$ which are the averages of squares of T(S), T(QS), TS(C), TS(QC), TSC(I) and TSC(QI) terms respectively, where these latter terms are defined in Table 32. The interpretation of these quantities is clear in the sense that for example, should $\sigma^2_{TS(C)}$ be small, it would indicate that the contribution to variability due to variation among classes within schools

is rather minor.

In the actual analysis (analysis of variance) the total variation observed among scores in a grade is broken up into 8 parts. These parts can then be expressed in terms of the components given above. Due to the unbalanced nature of the study the parts in the analysis of variance table do not have simple expression in terms of the components of variance and will not be given here. Also one can not obtain proper tests of significance. However, in the case of this data, this is not very serious since the interpretation is quite clear.

We first look at the analysis of the scores obtained in grade 1 in Table 33.

Even though one cannot make exact tests of significance one can make comparisons. First of all the comparison of the variation among classes within schools which contains both the components $\sigma^2_{TSC(I)}$ and $\sigma^2_{TSC(C)}$ is much larger than the variation among individual students within classes which is due to only $\sigma^2_{TSC(I)}$. This suggests that $\sigma^2_{TS(C)}$ is probably large, i.e., that there are detectable differences among classes within a school. This is probably a reflection of teacher differences.

A comparison of the among schools within treatments variation and the among classes within schools variation suggests that the school to school differences are smaller than one would have expected on the strength of the observed among classroom variation. The former contains the extra component $\sigma^2_{T(S)}$. The interpretation is that school to school differences per se are rather small and that observed differences are due to the lack of uniformity among classrooms.

A comparison of the variability due to differences between the control schools and the nutrition education schools and the variability among schools or among classes within schools indicates that nutrition education had a large

effect. Actual means must be consulted in order to ascertain the direction of the change. Presumably nutrition education improved the average scores.

Comparison of lines 5 and 7 in Table 33 suggest very little in the way of interaction of questions and schools. However, a comparison of lines 1 and 5 shows that there is considerable variation among questions.

Table 34 shows the results of the analysis of variance applied to the test data from second and third grades. Again there is evidence of significant class to class variation, little school to school variation except that due to non-uniformity of classes, little evidence of any interaction of question and schools or questions and classes and rather strong evidence of the effect of the nutrition education program. There is also a large component of variation due to differences among questions.

Table 32 Components in the model.

	Component	Interpretation	Symbol
1.	Mean	Average score for all questions and all students, both in control schools and nutrition education schools.	M
2.	Effect due to nutrition education	Average score for all questions for students on nutrition ed. was M + T, and students in control schools, M - T.	T
3.	Effect due to questions	Average score for all students on question No. i was $M + Q_i$.	Q_i
4.	Interaction of question No. i and nutrition ed.	This component allows for the possibility that nutrition education may cause greater improvement in one question than another. Average score on question i for students in control schools is $M - T + Q_i - (TQ)_i$ and in nutrition ed. schools is $M + T + Q_i + (TQ)_i$.	$(TQ)_i$
5.	Effect of schools within treatments	Variation in average scores from school to school on control or on nutrition ed.	T(S)
6.	Interaction of schools and questions	Component due to the fact that some schools show a greater response to some questions than others, both within control schools, and nutrition ed. schools.	T(QS)
7.	Effect of classes within schools	Variation in average scores from class to class within schools.	TS(C)
8.	Interaction of classes and questions	Variation due to the fact that some classes within a school respond differently on a question than other classes. (This component would increase if one teacher emphasized one topic while a second another topic.)	TS(QC)

Table 32. Continued

Component	Interpretation	Symbol
9. Effect due to a particular student	Variation due to the fact that some students have better average scores than others within the same class.	TSC(I)
10. Interaction of student and question	Variation due to the fact within a class some students will do well on some questions and some do well on others.	TSC(QI)

Table 33. Analysis of variance for grade 1 test scores.

Source of Variation	Degrees of Freedom	Components of Variance Included	Observed Value	Comparison
Among Questions	15	$\sigma^2_{TSC(QI)}$, $\sigma^2_{TS(QC)}$, $\sigma^2_{T(QS)}$, σ^2_{Q}	35.42	
Control vs Nutr. Ed. (Trt.)	1	$\sigma^2_{TSC(I)}$, $\sigma^2_{TS(C)}$, $\sigma^2_{T(S)}$, T^2	59.18	
Int. of Question & Control vs Nutr. Ed.	15	$\sigma^2_{T(QS)}$, σ^2_{QT}	1.55	
Among Schools Within Trt.	4	$\sigma^2_{TSC(I)}$, $\sigma^2_{TS(C)}$, $\sigma^2_{T(S)}$	1.43	
Int. of Question & Schools Within Trt.	60	$\sigma^2_{TSC(QI)}$, $\sigma^2_{TS(QC)}$, $\sigma^2_{T(QS)}$	.82	
Among Classes Within Schools	22	$\sigma^2_{TSC(I)}$, $\sigma^2_{TS(C)}$	2.52	
Int. of Question & Classes Within School	330	$\sigma^2_{TSC(QI)}$, $\sigma^2_{TS(QC)}$	.54	
Among Individuals Within Classes	10016	$\sigma^2_{TSC(I)}$	.17	

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Table 34. Analysis of Variance for Grades 2 and 3 test scores.

Source of Variation	Degrees of Freedom	Components of Variance Included	Observed Values Grade 2	Observed Values Grade 3	Comparisons
Among Questions	29	$\sigma^2_{TSC(QI)}$, $\sigma^2_{TS(QC)}$, $\sigma^2_{T(QS)}$, σ^2_{Q}	51.29	66.81	
Control vs Nutr. Ed. (Trt.)	1	$\sigma^2_{TSC(I)}$, $\sigma^2_{TS(C)}$, $\sigma^2_{T(S)}$, T^2	19.19	17.39	
Interaction of Question & Control vs. Nutr. Ed.	29	$\sigma^2_{T(QS)}$, σ^2_{QT}	1.09	1.15	
Among Schools Within Trt.	4	$\sigma^2_{TSC(I)}$, $\sigma^2_{TS(C)}$, $\sigma^2_{T(S)}$	1.38	3.98	
Interaction of Question & Schools Within Trt.	116	$\sigma^2_{TSC(QI)}$, $\sigma^2_{TS(QC)}$, $\sigma^2_{T(QS)}$	.59	.58	
Among Classes Within Schools	19	$\sigma^2_{TSC(I)}$, $\sigma^2_{TS(C)}$	1.99	2.30	
Interaction of Question & Classes Within Schools	551	$\sigma^2_{TSC(QI)}$, $\sigma^2_{TS(QC)}$	.44	.41	
Among Students Within Classes	18,450	$\sigma^2_{TSC(I)}$	.16	.15	

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APPENDIX D

Refuse Collection Procedures

Letters

Refuse Weights of Food Items from Grades 1-3 in Nutrition Education Experimental and Control Schools

Objective:

To weigh refuse of food items from 1-3 graders in the Nutrition Education experimental and control schools in Goldsboro and Alamance County in October and April.*

Goldsboro (G)	Alamance County
Friday, October 15, 1971	Wednesday, October 20, 1971
Monday, October 18, 1971	Monday, October 25, 1971
Tuesday, October 26, 1971	Thursday, October 28, 1971

Team	School	Principal	Manager	Time
1	Saxapahaw - A	Mrs. Barbara Tew	Mrs. Betty Walters	10:55-12:20
	Edgewood (1-2) - G.	Mrs. Zelma Borah	Mrs. Elizabeth Edens	11:00-12:30
2	South Mebane - A.	Mr. Bob Gordon	Mrs. Margaret Dixon	12:00- 1:00
	East End (3) - G.	Mr. Harvey L. Davis	Mrs. Mattie Stitt	11:20-12:00
3	North Graham - A.	Mr. Gerald L. Johnson	Mrs. Marie Andrews	11:00- 1:00
	**William Street - G.	Mr. James Gainey	Mrs. Ella Rich	11:50-12:05
4	**Haw River - A	Mr. L. G. Franklin	Mrs. Mabel Webb	11:00-12:50

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Team I	Team II	Team III	Team IV
Pearl Page, Leader	Chris Miller, Leader	Mary Ellen Parker, Leader	Ann Norkus, Leader
Bernice Craig	Ethel Terrell	Flo Reaser	Mary Ellen Senger
Polly Woodard	Hilda Patterson	Mary Lee Brannon	Betsye Clark
Alice Powell	Mary Liner	Marie Bayley	Mary Brown

Scheduled Substitutions: Date		Substitute	Team Person	Substitutes	Phone
October	15	Ann Norkus	Mary Lee Brannon	Edna McDougald	787-4997
	18	Majorie Johnson	Polly Woodard	Doris Eades	851-1733
	20	Gladys Hill	Mary Brown	Gladys Hill	782-2058
	20	Jean Peterson Britton	Mary Lou Senger	Marjorie Johnson Britton	787-8717 787-4179
	28		Mary Lee Brannon	Jean Peterson	833-9054

*The procedure for October will be repeated in April.

**Control Schools.

Responsibilities of Team Leaders

1. Set time for departure.
2. Arrange to get car from car pool (if necessary).
3. Keep time sheets for team members.
4. Keep supplies on hand.
5. Accept responsibility for making decision.
6. Assign responsibilities to team members.

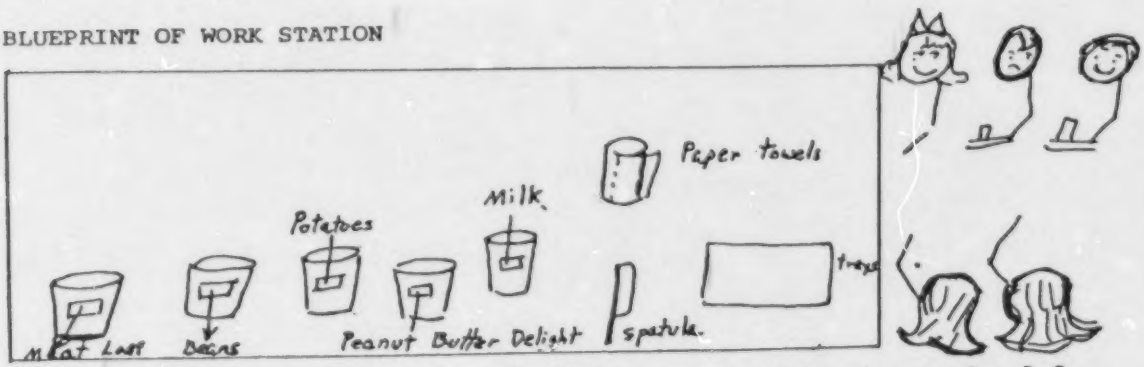
Data to be Collected

1. Weight of 4 servings of each food item as served to students.
2. Weight of refuse of each food item for minimum of 80 students.

Format for Collecting Data

1. Upon arrival at school, check in with the main office.
2. Set up working stations in cafeteria in the area designated by cafeteria managers.
   Two stations will be needed. Label a large plastic container for each food item.

BLUEPRINT OF WORK STATION



3. Collect 4 student trays of food during serving time for grades 1-3. (1 - first grade, 2 - second grade, and 1 - third grade)
4. Combine like food items from the trays.
5. Weigh and record the weight of the combined four servings of each using gram scale.

Weighing on Gram Scale

(a) Place container on scale
(b) Zero scale
(c) Weigh food
(d) Read scale and record weight

6. Collect trays from minimum of 80 students in grades 1-3. Do not include a kindergarten child. Also try to get an even distribution of first, second and third grade students throughout the serving period.
7. Scrape each food item from the tray into the labeled container for the item.

8. Weigh the containers of food on cafeteria scales after the specified collection period is completed or the specified number of trays have been collected.
9. Record weight of food in each container. Weight of food plus container minus weight of container = weight of food.

Supply Check List:

1. Spatulas
2. (8) small containers for weighing food servings
3. (8) plastic containers for food
4. Scales
5. Large plastic bags
6. Paper Towels

Menus for Schools Participating in Nutrition Education Phase of Research Project on Food and Nutrition Services in the Public Schools.

Goldsboro City

October 15

Meat Loaf w/ sliced pickle
String Beans
Creamed Potatoes
Peanut Butter Delight
Milk

October 18

Beef Stew
Turnip Greens
Cornbread
Chilled Peach Half
Cookies
Milk

October 26

Pork Patty
Rice-Gravy
String Beans
Wheat Rolls
Fresh Apple
Milk

Alamance

October 20

Vienna Sausage
Pork and Beans
Coleslaw
Cornbread
Milk
Apricots Cookie

October 25

Stew Beef
Cheese Stick
Tomato Salad
French Bread
Milk
Chocolate Cake

October 28

Meat Loaf w/ Tomato Sauce
Whipped Potatoes
Green Beans
Hot Rolls
Milk
Gelatin Dessert w/ whipped topping

School_____ Date_____

Food Item	Weight of 4 Servings (grams)	Weight of Refuse: Pounds Ounces	Observations by Collectors

Grade		Number of Refuse Trays

Total

Team Leader_____

MEMO: To all Team Leaders and all Team Members

Each team leader is responsible for keeping time sheets for her team members and substitutes. All time will go on one pay period. Sheets must be turned in by the leaders to Donna Whittington on the last day of collection. (Friday, April 21 for Team IV and Monday, April 24 for Teams I, II, and III). Checks will be ready on Friday, May 5. Please indicate on your time sheet if you wish to pick up your check or have it mailed.

APPENDIX E

Cognitive Nutrition Posttest for Students, K-3

NUTRITION EDUCATION PROJECT -- POSTTEST

To the Teacher:

The enclosed test has been constructed as a part of the nutrition education project in which your school district is participating. It will be administered to all the students in both experimental and control schools as a posttest at completion of the project.

The concepts listed in the Nutrition Curriculum Guide: K-3 were used as a basis for construction of test items. Questions 1-16 cover all the concepts at the level of grades K and 1. Questions 17-30 cover the same concepts in more depth. The first grade teacher should conclude the test after question 16. The second and third grade teacher should administer the entire test to the students.

Fill in the information requested on the first page of the answer sheet for each student. Distribute tests to the students. You might want to set the students at ease by referring to this test as a paper that is part of the nutrition project. Tell them that you will read some questions and that they are to circle the answer or answers on their paper. BE SURE THE STUDENTS UNDERSTAND THAT THEY MAY CIRCLE MORE THAN ONE CORRECT PICTURE OR ANSWER FOR ANY GIVEN QUESTION. The best answer may vary from one to all choices at sometime during the test.

The first three questions are sample questions. You might want to reproduce the pictures on the chalk board to demonstrate how to answer the questions. Read the first sample question to the students and demonstrate how to circle the correct answer. (Answers for these three questions are underlined on the teacher's sheet.) Read the next sample question, observe if the students are answering correctly, and repeat the demonstration. When

the students understand the correct procedure, begin the test.

Instruct the students to point to block number 1 on the first page. Check to be sure each student is pointing to the correct question. Read each question to the students, repeating any part of the question if necessary. Since many questions have more than one correct answer, allow the students sufficient time to mark their papers. When enough time has been allowed, move on to the next question. Do not go back to any of the former questions.

When the test has been completed, collect the answer sheets and place them in the envelope in which you received them. Leave the envelope in the main office.

Thank you for your cooperation!

SAMPLE QUESTIONS

Sample - 1: In the first box are pictures of soda pop, milk, and coffee. Circle the picture of the drink that is served with your school lunch.

Sample - 2: In the next box are pictures of ice cream, eggs, a hamburger, and cake. Circle the foods you would be most likely to eat at a birthday party.

Sample - 3: Move to the next box. There are pictures of ice cream, soup, lemonade, and milk. Circle the foods that are cold when you eat or drink them.

1. In box number 1 you will see pictures of a carrot, a fork, an ice cream cone, and a toothbrush. Circle the pictures of the foods that can be eaten.

2. Move to the next box. You will see pictures of a boy, a fish, a plant, and an airplane. Circle the pictures of the living things.

3. Move to the next box, number 3. You will see pictures of a pear, lettuce, an apple, and a potato. Circle the foods that are fruits.

4. Move to the next box. You will see pictures of a carrot, a banana, strawberries, and asparagus. Circle the foods that are vegetables.

5. Turn the page. In the box at the top of the page there are pictures of a turkey, mushrooms, an ear of corn, and frankfurters. Circle the foods that are meat.

6. Move to the next box. You will see pictures of a lamb, a goat, and a pig. Circle the animals that farmers raise to sell for food.

7. Move to the next box, number 7. There are pictures of a milkman, a cow, and a grocery store. Circle the very first place milk comes from.

8. Go on to the next box. There are pictures of a bag of flour, wheat, and a bakery. Circle where bread comes from first.

9. Move to the next box. You will see pictures of two boys. One is full of energy, the other is always very tired. Circle the picture of the boy who eats healthful meals and snacks.

10. Move to the next box, number 10. You will see pictures of soda pop, candy, a pear, a meat sandwich, and milk. Circle the foods that would make up a healthful lunch.

11. Move to the next box. You will see glasses of milk. Circle the number of glasses of milk <u>you</u> need to drink each day to stay healthy.

12. Turn the page. Begin with the box at the top of the page. There are pictures of fruits and vegetables in groups. Circle the <u>number</u> of fruits and vegetables you should eat every day.

13. Move to the next box, number 13. You will see pictures of a pork chop, a drumstick, sausages, and bacon. Circle the pictures of the foods that come from pigs.

14. Move to the next box. You will see pictures of a drumstick, eggs, steak, and frankfurters. Circle the pictures of the foods that come from chickens.

15. Go on to the next box, number 15. You will see pictures of soda pop, milk, an apple, and candy. Circle the foods that would make up a healthful snack.

16. Move to the next box. There are pictures of cheese, peanut butter, ice cream. and butter. Circle the pictures of the foods that are made from milk.

FIRST GRADE STOP HERE!

17. Move to the next box, number 17. You will see pictures of three ways that plants grow--below the ground, above the ground, and on trees. Circle the way carrots grow.

18. Move to the next box. You will see scenes of different climates--cold, hot and dry, and warm. Circle the climate where oranges grow.

19. Turn the page. In the box at the top of the page, you will see pictures of three ways that plants grow--below the ground, above the ground, and on trees. Circle the way oranges grow.

20. Go on to the next box. You will see pictures of baked beans, an apple, a potato, and peanut butter. Circle the foods that are included in the meat group.

21. Go on to the next box. There are pictures of a carrot, celery, a turnip, and a potato. Circle the pictures of the foods that are roots of plants.

22. Move to the next box, number 22. You will see pictures of asparagus, broccoli, cabbage, and cauliflower. Circle the pictures of the foods that are flowers of plants.

23. Move to the next box. You will see pictures of a glass of milk, a pear, and bread. Jim ate a chicken sandwich and cookies for lunch. Circle the other foods he needs to eat to have a balanced meal.

24. Move to the next box, number 24. There are pictures of an airplane, a truck, and a ship. Circle the ways that food is carried from the farm to the grocery store.

25. Go on to the next box. There are pictures of teeth, hair, bones, and eyes, Circle those parts of our bodies that need milk to stay healthy.

26. Turn the page. Begin with the box at the top of the page. You will see pictures of teeth, eyes, and muscles. Circle those parts of our bodies that need meat to stay healthy and grow.

27. Move to the next box. You will see pictures of lettuce, oranges, a grapefruit, and spinach. Circle the foods that have a lot of Vitamin C.

28. Move to the next box, number 28. You will see pictures of an apple, spinach, a carrot, and a pepper. Circle the foods you need to eat to get Vitamin A.

29. Go on to the next box. There are pictures of cheese, liver, spinach, and cantaloupe. Circle the foods that you could eat to get iron.

30. Go on to the next box. You will see pictures of different senses--sight, smell, and taste. Circle the senses that are important when you eat.

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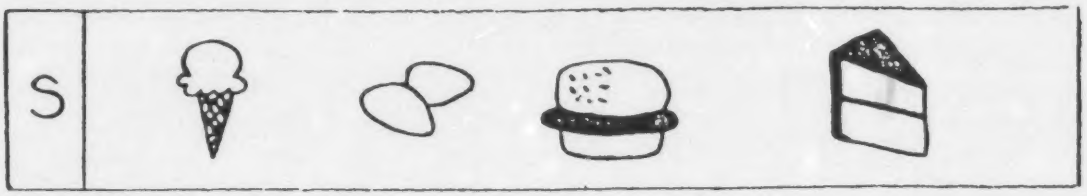
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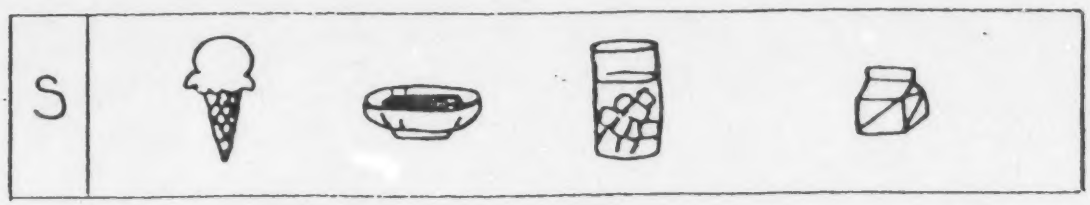
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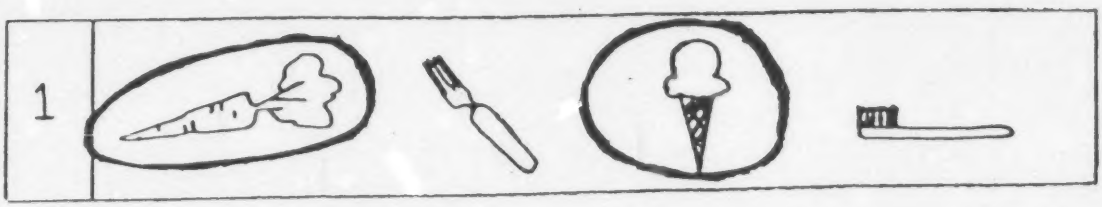
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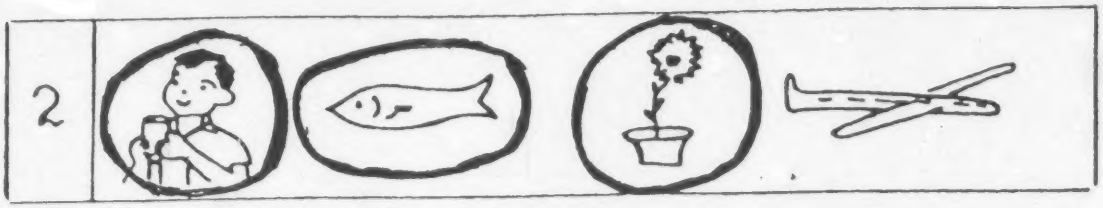
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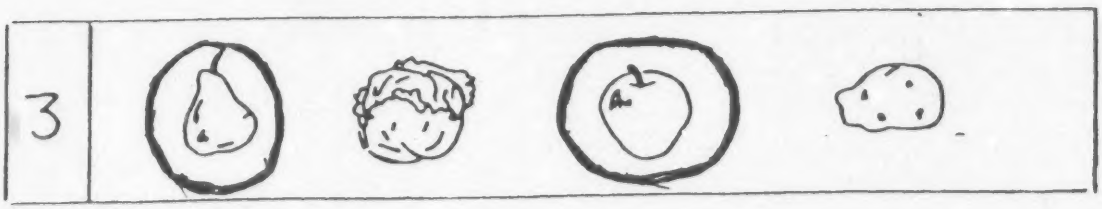
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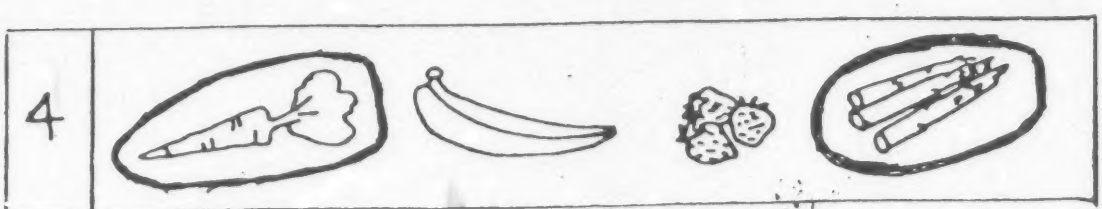
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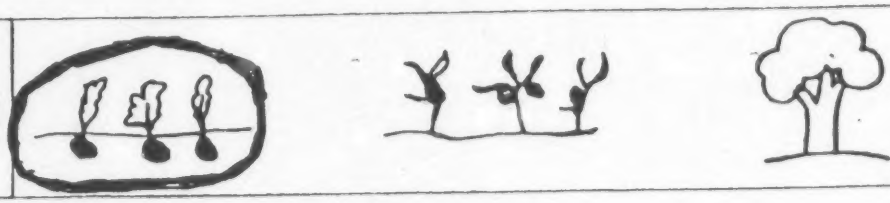

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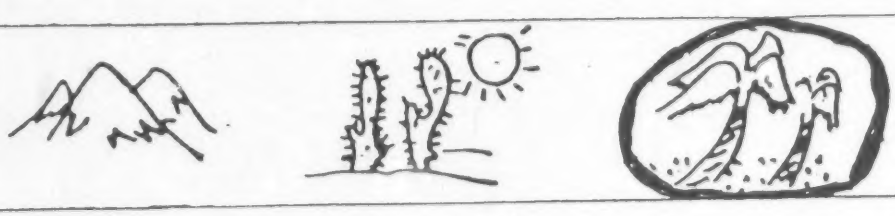

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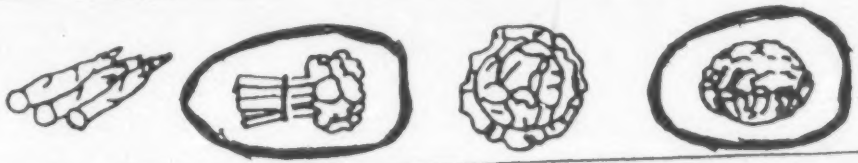

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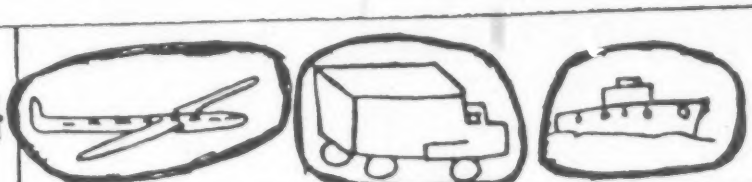

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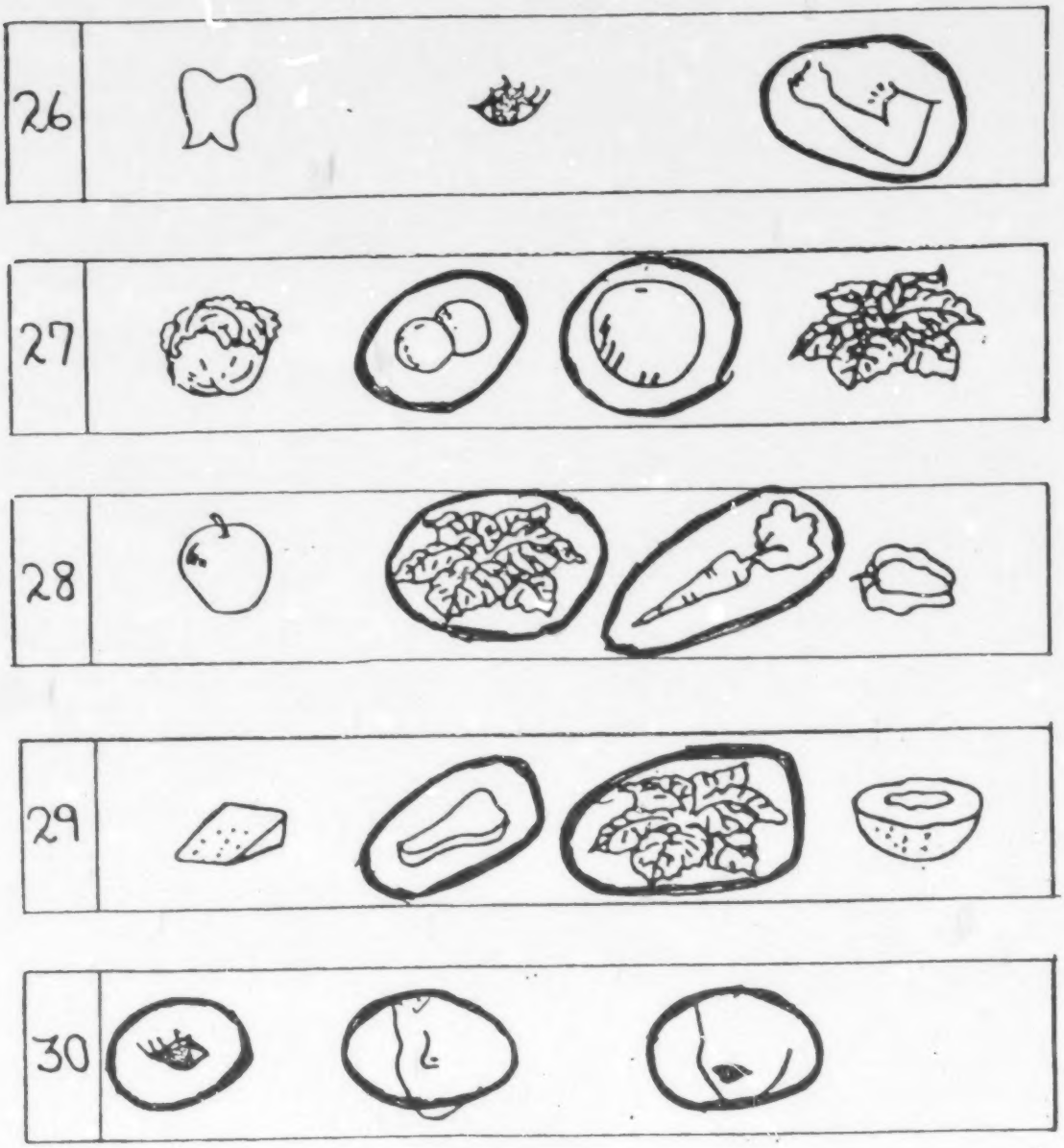
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